AVIATION WEEK

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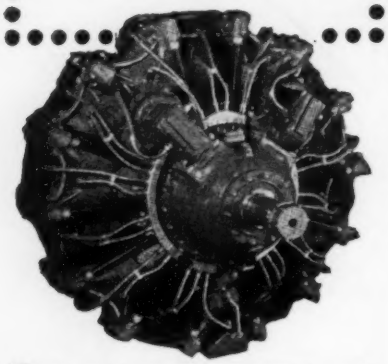

During the war, TITEFLEX made ignition shielding for practically every type of reciprocating engine used on military and civilian aircraft. Today there is scarcely an airline in the United States and Canada that does not use TITEFLEX ignition shielding on at least a part of their equipment.

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Aviation Week

ABP Member ABC

Volume 54 **February 19, 1951** **Number 8**

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Erwin J. Bulban.....Special Assignments
Thomas M. Self.....Los Angeles

Editorial Offices: 330 West 42nd St., New York 18, N. Y., Phone Longacre 4-3035 National Press Bldg., Washington 4, D. C., Phone National 3414.

Domestic News Bureaus: Atlanta 3, Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave., Cleveland 15, Hanna Bldg.; Detroit 26, Penobscot Bldg.; Los Angeles 17, 1111 Wilshire Blvd.; San Francisco 4, 68 Post St., Houston, 514 South St. *Correspondents* in more than 60 major cities.

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R. W. Martin, Jr., *Sales Manager;* J. G. Johnson, *Business Manager;* Anita Scaffo, *Research and Marketing:* Sales Representatives; J. C. Anthony, New York; M. J. Storz, Philadelphia; V. F. Dissette, Cleveland; L. J. Biel, Chicago; W. E. Donnell, St. Louis; J. H. Allen, Dallus; R. C. Maultsby, Atlanta; J. W. Otterson, San Francisco; C. F. McReynolds, Los Angeles. Other sales offices in Pittsburgh, Detroit, Boston, London.

February 19, 1951 AVIATION WEEK Vol. 54—No. 8

Member ABC and ABP

Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 18, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders.

Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada, $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Pan American countries, $10 a year; $16 for two years; $20 for three years. All other countries, $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A.

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What Next? they asked in 1908 . . .

Many times that year, Glenn Curtiss and J. A. D. McCurdy flew the pusher *June Bug*. An 8 cylinder air-cooled engine developing 30 horsepower got *June Bug* off the ground in 150 feet. Rate of climb was around 250 feet per minute. Mr. McCurdy reported recently that *June Bug* maneuvered well with lateral control effected by ailerons invented and first used by *June Bug's* sponsors, the Aerial Experiment Association.

What Next? they're asking in 1951 . .

Enemy interception is a tough assignment. Your gun platform needs tremendous rate of climb, extreme speeds and maneuverability. And these the Republic XF-91 provides... thanks to advanced aerodynamic design with both jet and rocket power.

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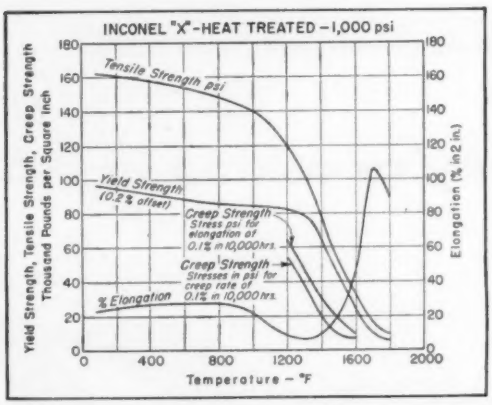
An oxidation-resisting alloy with very high strength over 1000°F

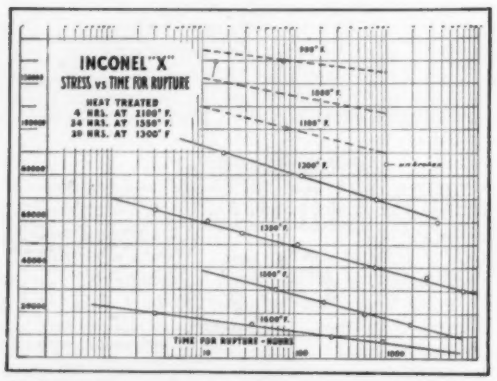
Inconel "X"® is an age-hardenable alloy which is unusually strong both at ordinary temperatures and at red heat. Suitably heat-treated, Inconel "X" has low creep rate under high stresses over 1000°F—and exceptionally high spring properties up to 1100°F.

The principal engineering characteristics of Inconel "X" (besides those shown on accompanying charts) are:

- **Oxidation Resistance**—Tests indicate that oxidation resistance of Inconel "X" is of the same order as that of Inconel.
- **Fatigue Strength**—Measurements of fully heat-treated Inconel "X" on rotating beam machines, at 100,000,000 cycles, show fatigue strengths ranging from 55,000 psi at 1200°F to 36,000 psi at 1500°F.


INCONEL "X"-HEAT TREATED—1,000 psi
Yield Strength, Tensile Strength, Creep Strength Thousand Pounds per Square Inch
Elongation (% in 2 in.)
Tensile Strength psi
Yield Strength (0.2% offset)
Creep Strength Stress psi for elongation of 0.1% in 10,000 hrs.
Creep Strength Stresses in psi for creep rate of 0.1% in 10,000 hrs.
% Elongation
Temperature—°F
0
400
800
1200
1600
2000

Short-time high-temperature properties of fully heat-treated Inconel "X".



High-temperature stress-to-rupture properties of fully heat-treated Inconel "X".

- **Impact Strength**—For fully heat-treated Inconel "X", typical impact strength values are: 33 ft. lbs. at −320°F, 37 ft. lbs. at room temperature, 67 ft. lbs. at 1500°F, and 113 ft. lbs. at 1600°F.
- **Hardness**—By proper heat treatment, the room temperature hardness of Inconel "X" can be developed as desired from BHN 140 to BHN 400.
- **Spring Properties**—By a combination of heat treatment and cold working, Inconel "X" develops unusually high spring properties. For spring applications from sub-zero temperatures up to about 650°F, it is useful where otherwise unusually strong ferrous springs must be used. Up to 1100°F, Inconel "X" springs will give useful performance where few other metals can be relied on.
- **Machining**—Inconel "X" is machinable in all conditions. Because of its strength and toughness, it cannot be machined as easily as softer metals; it can, however, be machined at entirely satisfactory rates.
- **Forging**—No unusual difficulties are encountered in forging Inconel "X", though heavier equipment than that used on ordinary steels is required.
- **Welding**—Inconel "X" can be welded by nearly all commonly used methods including: metal arc, inert gas metal arc, atomic hydrogen arc, resistance spot and seam, resistance butt welding. Satisfactory joints have been made between two parts of Inconel "X", and also between Inconel "X" and other alloys including standard Inconel, Stainless Steels types 310 and 347, and cast Stellite 21 and 30.
- **Applications**—Inconel "X" is used in gas turbine rotor wheels, blades; heavily stressed bolts; expansion bellows; valve springs in resonant jet engines . . . wherever a combination of high stress and extreme heat must be met.
- **Forms Produced**—Inconel "X" is supplied in most commonly used mill forms—billets, rod, flats, rounds, hexagons, sheet, strip, bar, wire, seamless tubes, and welding rods.

FURTHER DATA AVAILABLE

A 79-page reference manual "Inconel 'X', Data and Information," *contains all the engineering information compiled to date on this alloy. This publication is available, free, for your information.*

And for technical help on specific problems involving metals at high temperatures, write, outlining your problems, to Inco's Technical Service Section.

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NEWS DIGEST

DOMESTIC

Prof. Daniel C. Sayre has been named director of Princeton University's new James Forrestal Research Center, which is to be used for advanced work in aero engineering, jet propulsion and chemical kinetics and related sciences. Sayre, who is chairman of the Department of Aeronautical Engineering, will head a five-man administrative committee.

B-47 Stratojet combat crew training base proposed at Wichita is being studied by Boeing, USAF and community officials. Program would include putting up a permanent Air Force base adjacent to Wichita Municipal Airport, which would have two main north-south runways lengthened to 12,000 ft.

Corporation Aircraft Owners Assn. has decided to transfer national headquarters from New York to 1025 Connecticut Ave., Washington 6, D. C., effective Mar. 1. The move is felt necessary to permit closer cooperation with government agencies in the defense program.

Litchfield Naval Air facility, Goodyear, Ariz., adjacent to the Goodyear plant, is to be made a permanent Naval installation. A $3,064,000 program of rehabilitation and expansion are underway at the 600-acre base, where mothballed Navy planes have been stored.

Boeing C-97A operating on the Korean airlift has established a nonstop record from Japan to Hawaii of 10 hr. 23 min., 24 min. less than a previous PAA Stratocruiser mark. The C-97A averaged 375 mph., maintained 450 mph. for two hours.

Columbia Air Coach System, an agent selling tickets on large irregular airlines, has been charged by a New York County grand jury with fraudulent advertising and petty larceny. The grand jurors have adopted a resolution urging that the state legislature require licensing of agents selling passenger transportation on the nonskeds and that sufficient bond be posted by agents to protect ticket purchasers.

Louis W. Goodkind, former Bureau of Economic Regulation associate director, has been appointed acting deputy director of the larger Bureau of Air Operations by CAB Chairman Delos Rentzel. Robert E. Redding, confidential assistant to former Board member Russell Adams, has decided to resign from CAB to join the law firm of Chapman, Bryson, Walsh and O'Connell.

Air Express shipments via 34 certified airlines last year reached a new record of 4,213,441—16 percent over 1949. Gross air express revenues were up 32 percent to $22,745,582. Average weight per shipment increased from 19.7 lb. in 1949 to 22.6 lb. in 1950. Average shipment flew 743 miles in 1950, sightly less than the 772-mile average for 1949 air express shipments.

FINANCIAL

Garrett Corp. had an unaudited net profit of $790,000 for the six-month period ended Dec. 31, 1950, amounting to $1.25 per share after provision for estimated federal income and excess profits taxes. Net profit for the same period last year was $830,637 after federal income tax. Current period sales amounted to $13,033,000, a 26 percent increase over last year's figure. Current backlog of the AiResearch division is reported as about $38 million, compared to $32.5 million last November.

Capital Airlines has issued a call to redeem all its 4 percent convertible income debentures series B, due Sept. 1, 1960. Redemption date is Mar. 12. Holders may convert to common stock at 90 shares per $1000 debenture.

American Airlines racked up net earnings of about $10,400,000 in 1950, or $1.40 a share after preferred dividends, an unaudited report by the company shows. This was on revenues of $118,658,000, and compares with 1949's net of $7,144,570 on revenues of $103,206,000. Revenue passenger miles in 1950 were 1,808,000,000—up 15 percent from 1949.

INTERNATIONAL

Western allies have agreed in principle to permit Western Germany to do experimental work on industrial type gas turbine engines. Allied regulations have thus far prohibited German aeronautical research, automatically barring jet engine work, but the regulations will be amended.

Aerovias Brasil S. A., Brazil's western hemisphere flag carrier, plans to open Miami-New Orleans service soon, as an extension of its Rio de Janeiro-Miami route, and also open service Rio—Buenos Aires via Sao Paulo and Port Alegre.

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for hot dimpling—

of magnesium and the harder aluminum alloys

In dimpling magnesium and the harder aluminum alloys, the application of heat is recommended to eliminate cracked dimples.

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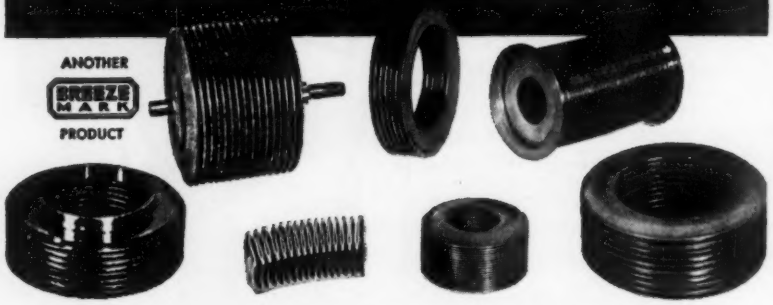
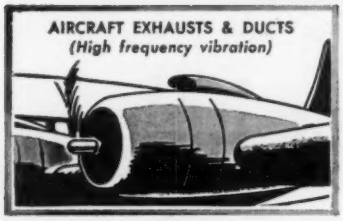
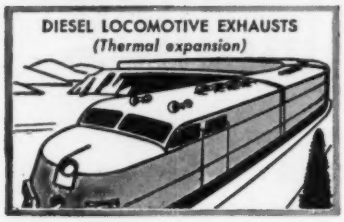
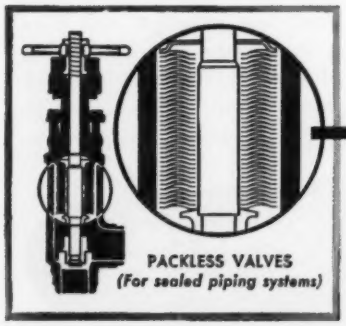
BREEZE Job-Engineered BELLOWS



...Give LASTING PROTECTION Where Ordinary Bellows Fail







Breeze welded diaphragm bellows meet the operating life cycle of any equipment in which they are used *because every Breeze bellows design is individually engineered and built for the job.*

Breeze has no "stock bellows," but if you have a vibration problem in ducts, large or small, or want permanently sealed valve enclosures in any type of piping system, or need bellows for torque transmission or other uses, Breeze experience can quickly provide the answer . . . and production can meet your requirements.

A Breeze bellows is dependable because each diaphragm is designed to work well within its elastic limit. This is accomplished by thorough analysis of each application and careful design of the bellows to withstand all requirements. "Job engineering" each individual type eliminates makeshifts, assures efficient performance.

Breeze bellows are made in stainless steel, inconel, monel, nickel, steel, or other weldable alloys.

Feel free to consult us without obligation on your existing bellows requirements, or any other project where reliable welded diaphragm type bellows might solve a design problem.

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SIDELIGHTS

Military

First news that USAF **fighter armament** is shifting to heavier caliber weapons comes from Northrop. The new F-89 has six 20-mm cannon instead of the World War II conventional 50-caliber machine guns. . . . That $4,251,260 order to **AC Spark Plug** is for a new high altitude model that will go into **Wasp Major engines, presumably** for B-36s . . . Air Force hired almost 3000 **civilian employes** in December, bringing the total to 186,359 . . . Army prods USAF to develop planes to **fly tanks.** Douglas' C-124 can carry a light tank but AF has only a few such craft. Army says it wasn't a case of insufficient tanks early in Korea but a case of not being able to get them there quickly . . . USAF will open its **6th air base** in England Mar. 1 at Sealand, Cheshire, increasing AF personnel in the British Isles to 21,000 . . . Air Force says it has sent first calls to nearly 80,000 **volunteer reservists** . . . Air Force **losses** from all causes in Korea through Jan. 18 totaled 223 planes.

Airlines

National's President Ted Baker and VP-Sales Sternberg had a pow-wow with Aerovias Guest people in Mexico City giving rise to rumors about a National-Guest **interchange** between New York and Mexico City.

People

Jimmy Doolittle of Shell is serving as a part-time, civilian consultant in research & development to Gen. Vandenberg, USAF chief of staff . . . Navy's Capt. **Robert W. Berry** will retire as a rear admiral, after 30 years' service . . . MGM has bought "The Story of **Col. Paul Tibbetts,**" written for the screen by Beirne Lay, Jr., about the man who piloted the Hiroshima B-29 in 1945 . . . Remember **R. McLean Stewart,** head of the old War Training Service during the war? He is a partner in the brokerage firm of William A. M. Burden & Co., and has been elected a director of Minute Maid Corp. . . . **Alice Rogers Hager,** ex-CAB public relations and well known aviation writer and editor, is in the U. S. on two months leave from her job of press attaché at our Embassy in Brussels, in charge of the office of information there.

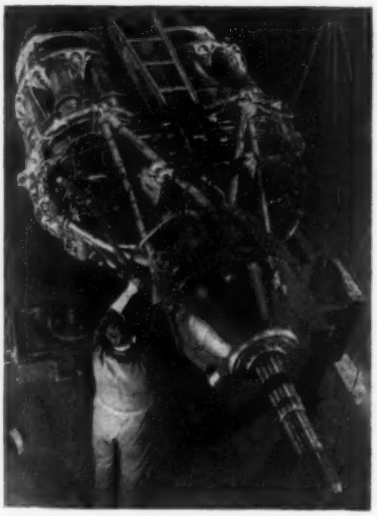
Atomic Air Power

Progress on NEPA's work—directed by Fairchild—toward an aircraft powerplant using atomic energy as heat is ahead of schedule and conversion to hardware is not far off.

Congress

A drive is underway to slash **CAA's budget** next fiscal year. Under the President's program, CAA would have $199 million to spend. Economy-minded Sen. Byrd claims this can be reduced by $75 million, eliminating non-essential activities. CAA spent $62 million in fiscal 1946.

OFF IN SECONDS—Using eight Rato bottles, Chase C-123 transport gets into the air six seconds after it started the takeoff, which required only 400 ft. of runway. The big USAF craft can haul over ten tons of cargo. Note the slim auxiliary fuel tanks under the wings.



PACKAGE FOR A PRINCESS—First Bristol coupled Proteus turboprop engine for the 140-ton Saro Princess-class flying boats now under construction is inspected (left) at the Bristol plant prior to cocooning and being mounted on a truck (above) for shipment. The Princess will use four of these engines plus two single Proteus units.

Picture Highlights of the Week

FRENCH ORIGINALITY—This interesting new prototype jet fighter, the SE 2410-01, now being tested, has two Hispano-Nenes mounted one above the other. The air intake is atop the fuselage behind the small-diameter nose. The low-mounted tail has variable incidence.

Washington Roundup

Tactical Planes on Way Out?

Army's Chief of Staff, Gen. J. Lawton Collins, expects the atom-headed short-range guided missile to be here for air support of ground troop operations "in not many years."

He lists its two major advantages over the tactical plane. It can be used:

• **Against enemy formations** a short distance off. Bombing has to be done "a safe distance" away. And bombing is of little help in staving off an attacking force nearing the point of contact for battle.

• **In poor visibility** "with considerable accuracy." Tactical planes are severely limited in night and bad weather operations. A slight miscalculation may mean that friendly, instead of enemy troops, are wiped out.

Atomic Artillery?

Atomic Energy Commission's Nevada testings may point to a revolution in military defense and offense strategy.

Joint Congressional Atomic Energy Committee's chairman, Sen. Brien McMahon, cautiously hints this: "The tests have widespread implications, from the field of civil defense against atomic attack to the field of military strategy and tactics."

Informed observers mark down the objective of the tests as the development of atomic-tipped missiles and artillery for tactical operations.

McMahon significantly refers to the "various" uses of atomic weapons. Heretofore, the atomic bomb—for long-range strategic attack on key cities and industrial concentrations—has been the only operational atomic weapon discussed.

Air Power in Being

Air Force spending is accelerating slowly.

The cash outlay rate reflects planes delivered, manpower in service. It's the barometer of the build-up of air strength in being, ready to strike.

During the six months after the Korean outbreak last June, USAF expenditures were at a rate of $5 billion a year. Now they are up to a rate of $6.6 billion. If mobilization goes forward according to plan, USAF expenditures will reach a peak rate of $13-to-$15 billion a year by the end of 1951, then level off.

PAA-TWA Fight

PAA will go all-out in a campaign to eliminate its biggest competitor, TWA, from the international airline picture.

PAA has a permanent certificate for the North Atlantic route to London. But TWA's seven-year temporary certificate to operate to Europe expires June, 1952. PAA and TWA officials are already sharpening their knives for a showdown battle on an extension.

PAA will argue: American taxpayers are being milked dry to support the defense effort and shouldn't be saddled with the additional burden of supporting two competing North Atlantic carriers. If all the business went to one line, subsidization would be minimized.

TWA officials report that PAA has already opened a propaganda campaign in European capitals, picturing TWA as a temporary fly-by-night operation that will soon be cut out of the picture and in the meantime shouldn't be taken seriously.

Testing Program Fizzle?

Some senators have written off hope that the $12.5-million prototype testing program will accomplish its objective: development of new cargo and feeder types under the incentive that the government will offset testing costs. Manufacturers, pressed with defense work, aren't too interested.

These senators are skeptical, in fact, that the program will accomplish anything worthwhile for these reasons:

• **They're impatient** at the turtle-pace approach. It took Commerce Department and CAA three months—from enactment of the program authorization in September to the first of the year—to decide who would administer it. It was mid-January before CAA officials and industry advisors met for the first "discussion." The outlook: CAA won't get around to asking Congress for a few hundred thousand dollars to do some minor testing until April.

• **These senators are doubtful** of CAA's indicated plan to by-pass the testing of advanced British and Canadian feeder and commercial jet aircraft in favor of test-running the Super DC-3 for feeder operations and the B-45 bomber for jet operations. The B-45 is so overloaded with armament that CAA officials concede that even with comprehensive data from test runs, its performance in commercial operation could be little more than "guessed at."

Aviation Gas

Prospect is that price rises and increased taxes on gasoline will add upwards of $15 million to the operating expense of the domestic airlines this year.

The domestic system consumed approximately 400 million gallons last year.

The price rise of approximately two cents a gallon since last fall means it will cost some $8 million more for the same amount this year.

Then, the President's proposal for doubling the gas tax—from one and one-half cents to three cents a gallon—would involve an increased levy for domestic carriers of over $7 million.

Air Transport Assn. hasn't decided whether to fight the tax boost.

What's Ahead

Defense Mobilization Director Wilson and Defense Production Administrator Harrison give this picture of what's ahead:

• Major shortages will be in the basics—steel, aluminum, copper—and the facilities to produce them. Additional steel capacity won't come into production in time to avert a serious machine tools situation; an acute aluminum situation "may" be averted. Materials for additional capacity for producing basics will have the right of way.

• **General order for priority for materials will be: military hardware to build up defense strength in being; stockpiling; military support—such as civilian air and rail transportation; industrial capacity; civilian needs.**

• By the target date of late 1952, the U.S. will have a year's supply of military hardware on hand to wage war, plus a substantially strengthened armed service to meet attack, and a greatly expanded industrial base.

WHO'S WHERE

In the Front Office

E. Victor Underwood has been elected president of Robinson Airlines. Underwood is one of the pioneers in the development of the carrier which will complete six years of service Apr. 6. He is president of the G. L. F. Holding Corp. **Bertram J. Miner** was elected chairman of Robinson's board.

Dr. L. H. Slotemaker has been appointed vice president of foreign relations for KLM Royal Dutch Airlines. He joined KLM in 1927 in a legal capacity and has held various positions since, including member of the board. He is a major in the Dutch Army Reserve and represented his country in working out bilateral air agreements all over the world.

David C. Prince, vice president of General Electric, has been named to the company president's staff, with special duties. Prince's former duties as head of the general engineering laboratory are being assigned to **Harry A. Winne,** vice president in charge of engineering policy.

Fleet Adm. William F. Halsey, Jr., USN (Ret.), has been elected president of International Telecommunication Laboratories, Inc., associate of IT&T. Halsey's experience in aviation radio aids will be utilized to further the corporation's research activities. He is also a member of IT&T's board and chairman of the board of All America Cables & Radio, Inc., IT&T's communications company serving Central and South America and the West Indies.

Col. Lester J. Maitland, for the past two years director of Michigan's department of aeronautics, has been named the state's civil defense director. With aviation experience dating back to 1917, Col. Maitland gained international fame in 1927, when he made the first flight to Hawaii with Lt. Hegenberger in a Fokker trimotor. He continues his duties as state aviation director.

Changes

Harold Keen, aviation writer with the San Diego Evening Tribune for 11 years, has joined Ryan Aeronautical's public relations staff. . . . **Thomas O. McCraney** has been named general counsel and assistant secretary of Pacific Airmotive Corp. . . . **Howard G. Golem** has been appointed director of procurement for Convair and will handle both subcontracting and purchasing.

Sheldon E. Young has been promoted to manager of field engineering service for the Barry Corp., Mass., vibration isolator specialists. . . . **Edwin H. Howell** has been named special representative for General Electric's Apparatus department in Washington, D. C. His former post (manager of sales of the Meter and Instrument divisions) has been filled by **Donald E. Craig.**

L. A. Person has been promoted to traffic manager for Braniff International Airways. . . . **Marion M. Mathews** has been named to the newly created position of superintendent of convention sales for United Air Lines at the company's executive offices in Chicago.

INDUSTRY OBSERVER

► Some Boeing officials predict that employment at the Wichita plant is going to 30,000, greater than the peak World War II employment on B-29 manufacture in 1944. Beech Aircraft is probably going to at least 7000 and Cessna is on its way up to at least 3000 workers. Current levels are less than 5000 at Beech and around 2000 at Cessna.

► **Reason for the high degree of interest in ramjet-powered helicopters currently shown by all three military services is the very high ratio of useful load to gross weight the "rotary flame throwers" can haul into the air. For a well-designed jet-powered copter, the ratio can be as high as 70 percent useful load, probably the best lift ratio yet achieved by any type of aircraft. Greatly increased moment of inertia, because of the mass of the engines at the tips, is credited with giving the jet copters improved flying qualities. The additional simplicity of the jet copter designs is also attractive. Main remaining problems are safe auto-rotational landings, high fuel consumption, and the high noise level.**

► Boeing's midget gas turbine engine, which grinds out about 175 hp. for its weight of less than 200 lb., is being looked at from a lot of angles, aeronautically as well as for stationary electric power generation. Lighter than conventional piston engines of the same size, it is attracting attention of helicopter engineers, small plane designers, and lighter-than-aircraft technical men, who envision a battery of the midget turbines lined up to provide power for a blimp.

► **Proof of the outstanding rescue work done by helicopters in Korea shows up in the report of U. S. Marines First Helicopter Squadron that its copters pulled out 26 airmen downed at sea and behind enemy lines, and evacuated over 550 wounded and injured men from front line areas in the period from August 1950 through January 1951.**

► Rolls-Royce, Ltd., has started a new production program for jet engines, probably Avon turbojets, in its Glasgow, Scotland factory, marking the first time jets have been built in Scotland. It is understood that the jets to be built there are powerplants for an RAF jet bomber, probably the Canberra.

► **Canadian Car & Foundry Co. will soon open its Ft. William (Ontario) plant to begin production of a new RCAF trainer plane, described as a modernized version of the North American Harvard (T-6). Meanwhile CCFC is now overhauling additional Harvards at its Montreal plant for the RCAF.**

► USAF has set Mar. 15 as deadline for airframe entries in design competition for a sonic-speed "1954 interceptor." Industry forecasters look for North American Aviation to win the prime contract with additional Phase I plane contracts going to Lockheed, Convair and Republic as possible alternates. This is the second half of a packaged requirements assignment given by USAF to the aviation and electronics industries, calling for a fully automatic sonic-speed interceptor capable of carrying an air-to-air missile and a pilot monitor. Hughes Aircraft (AVIATION WEEK Jan. 15) has already won the competition to supply electronic guidance system for the interceptor.

► **Experimental passenger helicopter service operated by British European Airways with British-built Westland-Sikorsky S51s between Cardiff and Liverpool is scheduled to terminate Mar. 31 after a 10-month trial period. The service which was not expected to show a profit in its experimental phase with small machines, has actually shown a loss of approximately $84 a trip. In summer operations with two roundtrips daily, the loss amounted to approximately $336 a day.**

► De Havilland of Canada is reported doing preliminary development work on a new scaled-up version of the Beaver, intended as a replacement for the Noorduyn Norseman as a larger single-engine bush plane freighter and military utility cargo plane.

AVIATION WEEK VOL. 54, NO. 8
FEBRUARY 19, 1951

Auto Makers Get More Engine Business

Nine license pacts already signed or near completion.

By Alexander McSurely

Big U. S. automobile companies are rapidly moving in, as in World War II, to dominate the volume production of aviation powerplants, an AVIATION WEEK survey discloses.

Nine licensing agreements for manufacture of aircraft powerplants by General Motors, Ford, Chrysler and the smaller independent auto companies are now known to be in final negotiation stages or completed. And this does not include the huge jet engine programs held by Allison division of General Motors, independently of the automobile division programs, nor additional air frame licensing agreements.

Records at the end of World War II showed that of the four top aircraft contractors in dollar volume, three were General Motors, Ford and Chrysler.

► **Jet Engine Plans**—Ford Motor Co., at the present time is negotiating with Westinghouse for licensing to produce jet engines, presumably the new sensational Westinghouse J-40 engine, unofficially rated at better than 7000 lb. thrust without afterburner and expected to reach the 10,000 lb. thrust class with afterburner.

Ford's Westinghouse production may be in the big Rouge plant, where Ford built Pratt & Whitney engines in World War II. The Ford J-40s will be in addition to sizeable Westinghouse production at Kansas City and Pittsburgh.

If the Westinghouse agreement is completed as expected this will give Ford production rights to two of the most important engines in the expanded military aircraft production program. Already Ford has taken over the huge Chicago plant operated by Dodge in World War II, where it is licensed to build the Pratt & Whitney R-4360 Wasp Major 3500 to 4000 hp. piston engine.

General Motors Corp. last week, meanwhile, was in the process of launching two of its major motor car divisions into jet engine high volume production programs:

• **Buick Division** announced it is completing a sub-licensing agreement with Curtiss-Wright Corp. to produce the 7200 lb. thrust J-65 Sapphire turbojet for the Air Force.

• **Chevrolet Division**, AVIATION WEEK has learned, will reopen its Tonawanda, N. Y., plant where it built piston engines for Pratt & Whitney in World War II, but this time it will build an Allison jet engine, probably a new and more powerful Allison J-35 engine rated at around the 10,000 lb. thrust class.

► **Partial Adaptation**—The $15 million Tonawanda plant, which included a half-million sq. ft. assembly bldg. and 94 engine test cells, was converting to make J-35 jet engines under license to General Electric at the close of World War II, so that the plant is already partially adapted to jet engine production.

Buick has already obtained a facilities letter contract for $25 million from the Air Force for the J-65 project, which is described as "the largest single defense contract Buick had ever received."

Like several of the other Air Force plans to get auto producers as contractors, the Buick facilities contract preceded completion of licensing negotiations for the engine, with Curtiss-Wright.

Roy T. Hurley, president of Curtiss-Wright, confirmed that there have been negotiations between his company and Buick, but said that "no agreement of any kind has been made." He stated that military requirements for the Sapphire will exceed Wright's present capacity and that Wright is licensing the engine for production by other companies.

Buick which built 74,000 Pratt & Whitney engines in World War II will build the major portion of its jet engine parts at its main Flint, Mich., plant, while assembly and test locations have not yet been announced by the organization.

The General Motors announcement of the Buick agreement said that the J-65 engine would power American fighter and bomber planes. It has already been designated as a powerplant for the Republic F-84F Thunderjet sweptwing fighter which General Motors has another licensing agreement to build in its Buick-Oldsmobile-Pontiac assembly plant at Kansas City. The plant was occupied by North American Aviation in World War II.

AVIATION WEEK has learned that the engine is being considered as the powerplant for the Martin B-51 three-jet ground support bomber, the English Electric Canberra two-jet intruder bomber which Martin may build in this country, and also is likely to be chosen for the new Navy North American F2J sweptwing fighter adapted from the straightwing FJ-1 and the sweptwing Air Force F-86.

The J-65 is a British-designed engine, carried through its early development by the Armstrong Siddeley Company,

Aircraft Engines Programmed For Automobile Companies

COMPANY	NEW MOBILIZATION	WORLD WAR II
Ford	West. J-40 & P&W R-4360	P&W R-2800
Buick	C-W (A-S) J-65	P&W R-1830 & P&W R-2000
Chrysler	P&W J-48	Chrysler IV-2220
Chevrolet	Allison J-35	P&W R-1830 & P&W R-2800
Packard	GE J-47	Rolls-Royce Merlin
Studebaker	GE J-47	Wright Cyclone 9
Hudson	Wright R-3350	None reported
Kaiser-Frazer	Wright R-1300	None reported
Nash-Kelvinator	None reported	P&W R-2800
Cadillac	None reported	Allison V-1710
Dodge	None reported	Wright Cyclone 18

and has successfully passed 150 hr. of flight tests in British flying test beds and fighter planes. Dimensions of the British Sapphire were: 133¾ in. length, 35¼ in. diameter, 6.8 sq. ft. frontal area, and dry weight 2500 lb.

▶**Improved Sapphires**—Since purchase of American manufacturing rights to the Sapphire in October, Curtiss-Wright engineers have already made a number of studies on further improvement of the engine, and it is expected that the Buick Sapphires will have advantage of this Curtiss-Wright development work.

Buick's announcement said its production of the Sapphire would start early next year. It is assumed that the volume production of the Curtiss-Wright J-65 at its big Wood-Ridge, N. J. plant will antedate the Buick production by several months.

With the sub-licensing to Buick of the Sapphire, Curtiss-Wright Corp. has probably the most extensive licensing program of any aircraft engine manufacturer, in contrast to its World War II record, when it did not license complete engines.

Other Wright licensing agreements include: R-3350 compound piston-turbine engine, Hudson Motor Co.; R-1300 piston engine, Kaiser Frazer Corp., Detroit, and Lycoming division, Avco, Stratford, Conn.

▶**P&WA-Chrysler Program**—Pratt & Whitney division, United Aircraft, in addition to its Wasp Major Ford licensing agreement previously reported, has another big licensing program with Chrysler Motors at Detroit, for the big J-48 jet engines, rated at 6250 lb. thrust dry, and well over 8000 lb. with afterburner. Besides its own huge plant at East Hartford, Pratt & Whitney has recently reopened its World War II satellite plant located at Southington, Conn.

General Electric Corp., which has been a major aircraft engine builder since it pioneered successful jet engines in this country during World War II with the American adaptation of the British Whittle engine, has made licensing agreements with two automobile companies for high volume production of its J-47 jet engine. Studebaker will build it at South Bend, and Packard at Detroit. It is likely that the version to be built will be an advanced J-47, which is also getting up around the 10,000-lb.-thrust class. General Electric is centering its own major jet production at its Lockland, Ohio and Lynn, Mass. plants.

Allison division of General Motors, which has produced more jet engines than any other U.S. manufacturer, is apparently relying on the Chevrolet Tonawanda plant program as the major augmenter of its own very large program at Indianapolis.

Flying Saucers

Ballooney, not baloney, says magazine article based on ONR report.

"Flying saucers" are large plastic balloons which have been sent up since the summer of 1947 by the Navy's Office of Naval Research, Look Magazine said last week.

Described as "skyhooks," the bags are 100 feet in diameter, climb as high as 19 miles, or around 100,000 feet, and sometimes are propelled by 200-mile winds.

Most of the 270 flights so far have originated at Camp Ripley near Little Falls, Minn., and at University Airport, Minneapolis. Other ascensions were at Chicago, Holloman Air Force Base and White Sands, N. M., and from aircraft carriers in both the Pacific and Caribbean.

The balloons carry instruments for various studies, including cosmic ray. A bigger model balloon is planned. It will go higher.

Look's story quoted Dr. Urner Liddel, chief of the nuclear physics branch of the Office of Naval Research.

"The Liddel report is considered to be the most authoritative scientific explanation of the flying saucer phenomenon," the magazine said. "As far as Dr. Liddel is concerned personally, he considers his answer incontrovertibly right.

"Observers have agreed that the best time of day to see one is at dusk of a cool summer evening. You may be standing on a plain in New Mexico or Montana. You may be flying a plane at 10,000 feet over Alabama. And there in the distance, above you but far from you, is a strange lighted disk. It may be moving or just hovering . . .

"This thing is round. It appears cup-shaped. It may appear to have a strong glow on one side (from the sunset) or be trailing an exhaust. What you have seen may be Flight 10, Balloon No. 3 of the Brookhaven National Laboratory at 84,300 feet carrying a 167-lb. payload consisting of a cloud chamber, a beacon transmitter, a Geiger telescope, an ionization chamber and photographic equipment. . .

"Dr. Liddel and his associates arrived at their findings on these baffling stories by studying about 2000 reports of flying-saucer observations of every kind and description. . . After a thorough investigation Dr. Liddel said 'There is not a single reliable report of an observation which is not attributable to the cosmic balloons.'

"Several reports have been received of squadrons of flying saucers. People have seen little disks apparently flying together in the sky. This is explained by Dr. Liddel as clusters of 20 to 30 balloons, 10 to 15 feet in diameter, which are sometimes used in place of the huge skyhook."

"After Dr. Liddel had sifted all the reports which appeared to have some foundation, he used his entree as a government nuclear physicist to check other government agencies. He is satisfied that no other research or experimental project has utilized anything even roughly resembling a flying saucer . . . and he said interplanetary travel is not possible at the present time."

(An editorial on flying saucers appears in this issue of Aviation Week.)

Fairchild Accedes to Union, Ending Strike

The five-week-old strike of UAW-CIO employes at Hagerstown Aircraft div., Fairchild Engine and Airplane Co., ended last week (Feb. 14) with the company acceding to virtually all union demands.

In a statement to employes, W. L. Landers, Fairchild general manager said, "Due to the national emergency and obviously grave need for our employes to get back to work, the Aircraft division has decided to eliminate the merit system for the duration of the national emergency.

"This is the issue that caused the strike and is presently keeping you out of the plant.

"We have also decided to make 12 cents an hour for all hours worked retroactive to Oct. 30, 1950 for all employes in the bargaining units who return to work. The 15 cents general increase will become effective the day you return to work. These two company offers, are subject to approval by the Wage Stabilization Board," Landers said.

Low Korea Air Losses

Extremely low aircraft losses experienced by U. S. Air Force and Navy forces in Korea indicating lack of serious air competition by Communist fighters, are shown in the Defense Department report on U. S. planes down in the Far East between June 27 and Jan. 15.

• **Air Force.** Grand total of 10 planes were shot down in combat and 213 were destroyed from other causes during the reporting period. One of the number lost to the Air Force was an F-86 Sabre which went down behind enemy lines last month.

• **Navy.** Accumulated Navy losses, which include those of the Marine Corps, reported during the same period are sketchy. Losses from all causes totaled 131 fighters. 25 bombers, 6 patrol planes and 20 other type planes.

SIX CANNON closely grouped around the F-89A's nose provide heavy firepower concentration.

20 MM SHELLS are power loaded using F-89A's electrical system or battery cart.

POWDER HAZE shrouds the desert dunes as the six cannon blast in Muroc test.

TRENCHES dug in the sand by the shells graphically show the cannon's tremendous destructive power.

F-89 Scorpion's Deadly Sting

Carrying elaborate airborne radars capable of making possible interceptions of enemy aircraft in the foulest weather, the two-place Northrop F-89A Scorpion is powered by two Allison J-35-A-21s (fitted with afterburners) giving about 6000-lb. thrust each. The F-89A is in the 600-mph. class. The potent six-gunned all-weather fighter is currently in large scale production for the USAF at Hawthorne, Calif.

Russians Can Make Good Planes

UN victories over Korea laid to our pilot rather than aircraft superiority; MiG-15 rated high.

By Alpheus W. Jessup
(*McGraw-Hill World News*)

Tokyo—Russians can make good airplanes. That is the only safe conclusion to reach after researching the performance of MiG-15 in Korea.

It is true that F-80, F9F, F-86 and F-84 pilots have shot down 20 MiGs, while the UN losses in air-to-air combat since Nov. 1 were only five, according to the Far East Air Force. And MiG pilots are definitely avoiding combat these days.

But the margin is pilotage and gunnery. American fighter pilots have completely outmaneuvered and outshot whoever flies the MiGs. The F-84 equipped with the electronic computing sights has hit the MiG at ranges up to 6000 ft. with .50cal. machine gun fire. The Russian plane has nothing to compare with it.

▶**MiG Performance**—What stand out about the MiG-15 are its speed, rate of climb, acceleration and ability to take a beating. Its top speed is rated well above 600 knots (intelligence thought it only 580 knots before Korea), only 15 to 20 less than the F-86 Sabre. It is at least 150 mph. faster than the F-80 and over 50 faster than the F-84 Thunderjet.

At sea level the MiG-15 climbs at about 8000 fpm. It climbs at 4000 fpm. at 30,000 ft. altitude. Coupled with its high speed, this climbing characteristic has enabled many MiGs to run away from combat.

Another advantage of the MiG is its apparent high rate of acceleration, which is considered greater than that of any U.S. aircraft now operating in Korea. Probably this is accounted for by an afterburner to the Nene or Nene-type engine with which the MiG is supposed to be equipped.

▶**They Can Take It, Too**—Many MiGs have been badly shot up but have still limped home across the Yalu. Pilots have been amazed at how much punishment it has taken and still kept flying. Apparently any jet aircraft is just naturally tough. The stressed-in strength necessary to keep a jet together at high speeds also withstands the gaff of battle.

This has not only been true of the Russian MiG but has also been true of U.S. aircraft.

Aerodynamically the MiG-15 probably is similar to the F-86 Sabre. The F-86 was patterned mainly after German designs captured at the end of World War II. There is good reason to believe that the Russians did a little better: nabbed the designer who drew the plans. Two major differences are evident. The MiG wing sweepback differs somewhat from the 35-deg. sweep of the Sabre. Another difference is the high placement of the horizontal stabilizer. It will be interesting to find out how it is anchored, remembering how many F-86s were lost during the early development period because of tail failure.

The high tail structure may add to the MiG's maneuverability at sonic speeds. There is a possibility that there is a compensating factor between the wing torque and the stabilizer position which enables the MiG to hang together under high loads. There is no doubt among pilots that the MiG has taken a heavy G load.

Gross weight of the MiG is between 12,000 and 13,000 lb. Its wingspread is 32 ft. 6 in. and its length 32 ft. 9 in. Its range is unknown but approximates that of the F-86. The MiG has come south of the Korean-Manchurian border only as far as Sinanju according to confirmed sightings. But there is no indication that it has broken off combat because of fuel shortage. The MiGs operate from what appears to be an excellent concrete airport at Antung, with a 7000-ft. runway, a second runway under construction, and a circular perimeter taxiway. Aircraft are kept in revetments.

One F-80 wing commander now just over the combat fighter age says he will fly the day his boys are allowed to run their first fighter sweep over the field. As it is, pilots watch the MiGs take off, climb to altitude unmolested and then decide whether to engage or not. Usually the MiGs attack only with a numerical superiority of 50 percent or more.

▶**Low Lethal Load**—The lethal load of the MiG is low order. There's no indication that it could ever be adapated for fighter-bomber work. Its armament includes one 37mm. cannon, with muzzle velocity so low that our pilots can see the white-hot shot slowly curving through the air. But it will knock a big chunk out of anything it hits.

At least one of our jets which might have been an F-86 or an F-84 lost to the MiGs in air battle is believed to have gone down with a 37mm. hit right up the tail pipe. On the other hand, several U.S. pilots report firing long .50cal bursts up the tail pipe of the MiG-15 with no noticeable effect. Besides the 37mm., the MiG carries two 23mm. machine guns. All guns are located under the lower lip of the air inlet.

▶**Who Flies Them?**—Still unanswered is the question of who flies the MiG. The pilots may be Chinese; but there is considerable speculation that they are Russian or German. This speculation is supported by the unwillingness to engage in combat other than over Communist-held territory "for fear that we might find out that they were Russian."

But other "authorities" say that the Russians never turn over their newest and best equipment even to their satellites, so why should they give the Chinese their as-far-as-is-known best fighter airplane.

It also is said that the only Chinese who might have the training to fly MiGs are those who were trained in the U.S. during World War II and who only after 1948 deserted Chiang's ranks for Mao's. Such Chinese are not trusted. So it is doubted that MiGs would be turned over to them. F-86 pilots who flew against the Germans in Europe are convinced that the tactics used by the MiG pilots are identical with those used by the Luftwaffe, and conclude therefore that the pilots are German.

▶**U.S. Losses**—The Far East Air Force has identified only one of its air-to-air losses as a B-29. The others could be

ADAMS JOINS CAB

Newest member of the Civil Aeronautics Board is 44-yr.-old Joseph P. Adams, recently sworn in for a six-year term by Board Chairman Delos W. Rentzel. Adams has a wealth of aviation experience beginning in 1930 when he graduated from the Marine Corps as a flying officer. He saw active duty during World War II with the Corps. He has a commercial pilot's license and was formerly director of aviation for the state of Washington from 1946-1949. He leaves a private law firm to come to Washington to take his new post.

F-86 Sabres and F-84 Thunderjets.

One MiG pilot, an aggressive character flying a plane with a broad diagonal red stripe, according to U.S. pilots, is credited with two jets—one Shooting Star and probably one F-84.

Eight victories over the MiG-15 were scored by the F-86, four each by the F-80 and the F-84, three by the F9F and one by a B-29. Five probables are claimed by the Far East Air Force, along with probable damage to 38 more. Although many MiGs have been observed near the Manchurian border they have made no attempt to engage the UN air force since Jan. 25.

Col. John Meyer, World War II ace who commands the F-86 group here, thinks there would be only a slight edge for the F-86 in a battle between half his group flying the MiG-15 and half flying the F-86. Any final evaluation of the Russian fighter must wait until we either get our hands on one or until their pilots reach a fighter skill comparable with that of our pilots.

Negotiated Contracts

Awards totaling $19,854,924 are contained in the Air Force list of negotiated contracts for the week ended Feb. 2. The maior awards were to Loewy Construction Co., Inc., New York (nearly $11 million for die forging and extrusion presses), and Mystic Adhesive Products div. of Chicago Show Printing Co., Chicago (slightly over $1 million for adhesive cloth tape). The awards were shared by 65 companies.

Aero Supply Mfg. Co., Inc., Corry, Pa., aircraft bolts, Cl. 04A, $82,395.

Air Associates, Inc., Teterboro, N. J., aircraft bolts, Cl. 04A, $28,650.

Aircraft Hardware Mfg. Co., Inc., Bronx, N. Y., aircraft bolts, Cl. 04A, $45,925.

Alma Knitting Mills, Inc., Gloversville, N. Y., gloves, Cl. 13A, $49,500.

Aluminum Co. of America, Washington, D. C., aluminum bar, Cl. 23A, $57,230.

American Brass Co., Waterbury, Conn., brass and copper wire, Cl. 23A, $55,952.

American Cord & Webbing, New York, webbing cotton natural, Cl. 21, $38,220.

Armstrong-Blum Mfg. Co., Chicago, power hacksaw blades, Cl. 17B, $52,080.

E. C. Atkins & Co., Indianapolis, saw blades, Cl. 17B, $67,200.

Aviation Activities Co., Grand Prairie, Tex., aircraft props and accessories, Cl. 03A, $57,200.

Avildsen Tools & Machines, Inc., Chicago, twist drills, Cl. 17A, $26,682.

John Bean div., Food Machinery & Chemical Corp., Lansing, Mich., spare parts for crash fire trailers, Cl. 19C, $51,040.

Bell & Howell Co., Chicago, Bell & Howell spare parts, Cl. 10D, $89,195.

Bunell Machine & Tool Co., Cleveland, post propeller assembly, Cl. 17A, $47,388.

Carrier Corp., Syracuse, N. Y., cooler, stationary, Cl. 08E, $46,876.

Celanese Corp. of America, New York, cellulose acetate sheet, Cl. 23B, $27,674.

Cherry Rivet Co., Los Angeles, rivets, blind, aluminum alloy, Cl. 29, $37,659.

Cleco div. of Reed Roller Bit Co., Houston, Tex., riveters, pneumatic-compression, Cl. 17A, $29,992.

Compco Corp., Chicago, plotting tables, Cl. 10B, $113,441.

D. C. Cooper Co., Chicago, humidity indicator cards, Cl. 17C, $406,000.

Delron Co., Inc., Los Angeles, steel nuts, Cl. 04A, $575,081.

Deutsch Co., Los Angeles, aircraft hardware, Cl. 04A, $44,606.

DoAll Cincinnati Co., Cincinnati, saw blades, Cl. 17B, $48,571.

Dumont Aviation & Supply Co., Long Beach, Calif., bushings, Cl. 04A, $50,234.

Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, N. J., contractors, Cl. 03C, $54,972.

Elastic Stop Nut Corp. of America, Union, N. J., steel nuts, Cl. 04A, $204,936.

Electric Auto-Lite Co., Port Huron, Mich., cable, Cl. 08B, $166,442.

Electric Auto-Lite Co., Toledo, fabrication of spare parts for use on electrical power plants and oxygen generators, Cl. 19C, $39,614.

Federal Aircraft Works, Minneapolis, test skis, $26,386.

B. F. Goodrich Co., Akron, aircraft hose, Cl. 04, $25,094.

Graham Aviation Co., Butler, Pa., operation of Greenville AFB, Miss., for basic flying training, $940,000.

Brad Harrison Co., Oak Park, Ill., cable assemblies, Cl. 19A, $64,712.

Howe Scale Co., Cincinnati, scales, Cl. 17A, $43,529.

Hycon Mfg. Co., Pasadena, Calif., shutter assemblies, Cl. 10A, $65,042.

Ideal Electric & Mfg. Co., Mansfield, O., motor generators, Cl. 17A, $353,925.

Illinois Glove Co., Champaign, Ill., gloves, Cl. 13A, $247,200.

Independent Pneumatic Tool Co., Aurora, Ill., riveters, pneumatic-compression, Cl. 17A, $48,400.

Bill Jack Scientific Instrument Corp., Solana Beach, Calif., camera control system and magazines, $510,000.

Leshner Corp., Hamilton, O., cotton, wiping cloth, Cl. 21, $49,000.

Linde Air Products div., Union Carbide & Carbon Corp., New York, liquid nitrogen, Cl. 06B, $28,850.

Loewy Construction Co., Inc., New York, die forging press and extrusion press, $10,932,052.

Long Island Waste Co., Inc., Brooklyn, cotton wiping cloth, Cl. 21, $194,600.

Mansfield & Green, Cleveland, portable hydraulic pressure gage testers, Cl. 17C, $26,106.

Midwest Glove Corp., Chicago, gloves, Cl. 13A, $53,550.

Morse Instrument Co., Hudson, O., timers, Cl. 10B, $135,359.

Mystik Adhesive Products div., Chicago Show Printing Co., Chicago, cloth, adhesive tape, Cl. 43, $1,024,764.

National Safety Council, Chicago, safety material, Cl. 30, $25,000.

Parker Appliance Co., Cleveland, packing O-rings, Cl. 04B, $233,573.

Phoenix Trimming Co., Chicago, webbing cotton natural, Cl. 21, $137,832.

A. Pritzkes & Sons, Boston, flying jackets, Cl. 13A, $196,409.

Rae Columbus, Inc., Columbus, O., field maintenance shelter, Cl. 19A, $45,782.

Reed Products Inc., Milwaukee, flying trousers, Cl. 13A, $218,700.

Revere Copper & Brass, Inc., Detroit, brass sheet, Cl. 23A, $26,675.

Reynolds Metals Co., Louisville, Ky., aluminum bar, Cl. 23A, $93,458.

Rice Stix, Inc., St. Louis, packing cases, Cl. 43, $224,448.

R. R. Robertson Co., Chicago, still picture camera and spares, Cl. 10B, $120,623.

Rochester Optical Mfg. Co., Inc., Rochester, N. Y., flying sun glasses, Cl. 13C, $55,800.

San Angelo Foundry & Machine Co., San Angelo, Calif., former, slip roll, power-driven, Cl. 17A, $70,500.

Sanatex Corp., Chicago, cotton, wiping cloth, Cl. 21, $47,220.

Skinner Purifiers div. of Bendix Aviation Corp., Detroit, fuel filter kits, Cl. 15, $453,635.

Tru-Fit Trousers, Traverse City, Mich.; flying trousers, Cl. 13A, $162,200.

United States Steel Corp., Pittsburgh, steel structural angle & plate, Cl. 23A, $36,380.

United States Trunk Co., Fall River, Mass., plywood typewriter carrying case, Cl. 25A, $53,969.

Western Mfg. Co., Detroit, spare parts for fuel servicing trailers, Cl. 19C, $52,239.

Wichita div., Boeing Airplane Co., Wichita, sling assembly, Cl. 19A, $85,408.

61 Convair-Liner 340s Ordered Since Jan. 1

Continental Air Lines has ordered eight new 44-passenger Convair-Liners, now called the Convair-Liner 340 rather than 240A as earlier reported. The Texas Company has ordered one.

This brings total orders of the new enlarged Convair-Liners to 61 planes since the first of this year—30 for United Air Lines, 20 for Braniff Airways, eight for Continental, two for Arabian American Oil Co., and one for the Texas Co. There are already 119 Convair-Liner 240s operated by U. S. airlines and 51 by foreign.

▶ **Convair 340 Specifications**—The new Convair is bigger all around than the 240 (AVIATION WEEK Jan. 29). Most important new features of the 340 are:

- **Fuselage length** is 80 ft. 2 in.—which is 5 ft. 6 in. longer than the 240, thus allowing room for four more passengers and more cargo space.
- **Gross weight** is 45,000 lb., compared with the old 40,500 lbs.
- **Fuel capacity** is up from 1000 gal. to 1900 gal.
- **Maximum payload** is 12,012 lb. Maximum landing weight is 44,500 lb.
- **Takeoff** at sea level at full gross weight requires 4000 ft. effective runway.
- **Operating weight empty** is 29,372 lb., compared with 26,400 lb. for the 240.
- **Power plant** is two Pratt & Whitney R-2800 CB-16 engines rated at 2400 hp. (wet) each. Engines on the 240 are mainly the CA-18.

• **Propellers** are Hamilton standard 6895A12 dural blades.

• **Wing span** is increased by 13 ft. 11 in. to 105 ft. 8 in.; wing dihedral is increased by nearly two degrees on outboard panels.

• **Larger tires and longer struts** on main landing gear raise tail height to 27 ft. 10 in., up 11 in. from the 240 height.

▶ **Performance**—The Convair 340 is expected to cruise at 290 mph. at 56 percent of rated power, or 1350 hp. per engine. Practical airline range of 1000 miles is reported possible at this power carrying 7700 lb. payload, allowing 1200 lb. reserve fuel. Range of 500 miles permits a payload of 10,000 lb. if operated at 20,000 ft. altitude with the same settings and reserve.

▶ **Rising Airliner Capacity**—The Continental order raises the number of postwar twin-engined transports on order for airlines to 61 Convair-Liners and 76 Martin 4-0-4s, this total of 137 fast 2-engined transports is scheduled to be delivered in the next 24 months.

These 58 Convairs ordered by the airlines are expected to be approved by the CAB for DO priority by Mar. 15, then by the Air Coordinating Committee Claimants Division and the National Production Authority by Apr. 1. They will be production-scheduled by the Aircraft Production Resources Agency at Wright Field about Apr. 5.

RAF Pilot to Fly Canberra to U.S.

An RAF pilot is expected to fly an English Electric Canberra light bomber to the U.S. sometime this month, for tests at Wright Field and probably at Eglin Field, Fla.

USAF Secretary Finletter has already indicated (AVIATION WEEK Feb. 5) the plane is likely to be built in quantity in this country by Glenn L. Martin Co. for use as a night intruder, on missions similar to those now being performed by the Douglas B-26 in Korea and by the earlier Douglas A-20 in World War II, in Europe. Plane's light wing-loading, excellent maneuverability and high rate of climb make it especially adaptable for this work.

It is expected that the American-built Canberras will be powdered with two J-65 Sapphire turbojets, built either by Curtiss-Wright or Buick division, General Motors, rated at 7200-lb. thrust dry each. They will replace Rolls-Royce Avon engines presently fitted in the British-produced models rated at more than 6000-lb. thrust each.

The Canberra—wingspan 63 ft. 11 in. and length 65 ft. 6 in.—has a new modification, increasing its tail fin area, and a new fairing behind the cockpit.

It is understood that if the plane is built in this country, the original Canberra design will be considerably modified for its new night intruder mission, to carry a heavy load of rockets, armament and radar, in place of the bomb load now provided for. Final decision to build the plane in this country has not yet been made. It probably depends on tests by USAF pilots in this country.

A spokesman for the Martin Co. last week said that C. C. Pearson, president, had returned from England where he had seen the Canberra (AVIATION WEEK Jan. 29). He declined to make further comment on the company's plans for the airplane.

Boeing, Bristol Sign Assistance Pact

Mutual interests of the Boeing Airplane Co. and Bristol Aeroplane Co. of England, in ramjet engines and some other defense products are to be served in an agreement for technical collaboration in research and development signed last week by the two companies.

Boeing has agreed to provide Bristol with engineering data it has already developed relating to the projects, and both companies hereafter will exchange technical information on further progress. A limited interchange of technical personnel working on the projects will be provided.

The agreement was signed by Cyril F. Uwins, Bristol Aircraft division manager, and Wellwood E. Beall, Boeing vice president, engineering and sales, for their companies, after conferences in Seattle.

OGM Report

Huge outlays are now scheduled for guided missiles procurement.

Military staff agencies concerned with guided missiles procurement were spurred to faster action this week as details of the first report of the new Director of Guided Missiles to the Secretary of Defense seeped out through the Pentagon.

Approximately $600 million is scheduled for guided missiles research, development and initial production out of defense fiscal 1951 funds. Then a triple build-up of allocations programmed for guided missiles to $2 billion in the fiscal 1952 budget follows. There is widespread speculation in aircraft circles over which companies will get the contract plums.

K. T. Keller, president of the Chrysler Corp., appointed by Defense Secretary Marshall to ride herd on this nation's lagging guided missiles program (AVIATION WEEK Oct. 30) has just completed a hasty but thorough tour of U. S. missile projects and facilities.

▶ **Quantity Production Urged**—In a report on his survey made jointly to Secretary Marshall and the Armed Forces Policy Council, Keller stated unequivocally that the state of the art of guided missiles is now developed to a point where crystallization of several programs to immediate missile service test quantity production should begin at once.

Principal guided missile contracts to the Air Force, which now has overall cognizance of the U. S. guided missiles effort, are: Bell Aircraft, Boeing Airplane, Consolidated-Vultee, Hughes Aircraft, Glenn L. Martin, North American Aviation, and Northrop. Other major contractors include Fairchild Engine and Airplane, Douglas Aircraft, General Electric, and Westinghouse.

These contractors are building for the three military services weapons which, when in production, will run the gamut in unit cost from $1000 to $39,600. Ranges of the various missiles in development are just as varied as their unit costs. Small air-to-air missiles in final stage of development, ready for immediate production are estimated to cost in the neighborhood of $1000 each, while a missile with a range of 1000 mi. has an estimated production cost of $39,600.

▶ **Information Exchange**—Prior to establishment of the Office of Guided Missiles, greatest deterrent to the development of usable weapons was the lack of coordination or complete interchange of technical information between services. Similarly the very competitive spirit of private industry has been in small measure an obstacle to more rapid development.

For example, in the past, a missile under development by one service might have a guidance system urgently needed by another service to perfect another manufacturer's missile. The guidance system, although in use by one service, could be lost to another service by poor coordination between manufacturers and services.

Keller was appointed by Secretary of Defense Marshall Oct. 26, and charged with creating an agency, within the structure of the Defense Department, to coordinate all guided missile research and development and to plan for standardization of the fewest practicable types for production.

Three new guided missiles now in final test phase will be in production for service testing by end of calendar year 1951, military sources state. In addition to these, Glenn L. Martin has already received Air Force authorization for manufacture of the Matador missile and the Fairchild Engine and Airplane Corp. is already in production on a fixed price basis with its Lark.

FINANCIAL

Investment Trusts Buy Air Shares

Funds have generally increased aircraft, airline issues in portfolios to reap advantage of improved values.

The improved market values of airline and aircraft securities are evident in an examination of the 1950 year-end accounts of specialized aviation investment trusts.

National Aviation Corp., the largest single fund devoted exclusively to aviation investments, provides the most interesting study in its portfolio shifts of last year.

As of Dec. 31, 1950 its net assets were up to $10,014,748, or $22.37 per share. This compared with only $7,439,545, or $16.65 per share on Dec. 31, 1949. The 1950 year-end showing is after the disbursement of $736,683, or $1.65 per share in dividends.

This appreciation in National Aviation's portfolio is primarily due to advancing market prices of its holdings. It is evident that this fund makes a definite attempt to balance commitments along policy lines formulated on a continuing basis.

►**More Airline Interest**—For example, during 1950 a constant build-up in airline shares was in progress. At Dec. 31, 1950, airline holdings accounted for 43.1 percent of the total portfolio as compared with 36.2 percent a year earlier. Aircraft and accessories remained virtually unchanged at 48.4 percent with cash, U. S. securities and receivables declining to 8.5 percent from 16.6 percent.

On balance, purchases of aircraft and airline investments outweigh aggregate sales. In a number of instances where securities were sold, it is probable that the compelling reasons may have been tax considerations and the desire to reduce individual positions grown too large by market appreciation.

During the last six months of 1950, National Aviation purchased the following additional aircraft shares: 200 Boeing; 2700 Curtiss-Wright "A" and 600 Sperry. Shares sold were represented by 900 Bell; 1700 Bendix; 10,000 Convair; 2800 Douglas; 12,000 Grumman; 8500 Lockheed; 5500 North American and 4400 United Aircraft.

In the airline group shares acquired during this period were: 10,000 American Airlines, common; 3000 Braniff; 2500 Chicago & Southern; 400 Delta; 4500 Eastern; 7500 Pan American; 8500 TWA and 19,000 United. The only sale was 1600 American Airlines, preferred.

Reflecting these adjustments, National Aviation's portfolio as of Dec 31, 1950, consisted of the following:

• **Aircraft**—19,500 Bell; 7500 Bendix; 200 Boeing; 5000 Convair; 7500 Curtiss-Wright "A;" 5000 Douglas; 7500 Garrett; 2400 Greer preferred; 20,000 Grumman; 16,500 Lockheed; 24,500 North American Aviation; 5600 Sperry; 13,000 Thompson Products; 12,500 United Aircraft common, and 1500 United Aircraft, preferred.

• **Airlines**—30,000 American Airlines common; 10,400 American preferred; 23,000 Braniff; 17,500 Chicago & Southern; 17,900 Delta; 30,000 Eastern; 15,000 Pan American; 17,500 TWA, 24,000 United Air Lines common and 5010 United preferred.

• **Other**—10,000 Helicopter Air Service Class "A;" 10,000 Resort Airlines; 10,000 Air Express International.

The total cost of the portfolio of National Aviation at Dec. 31, 1950 was $6,574,020. The market valuation, however, stood at $9,136,121, as of that date. The only commitments selling below cost were Air Express International and Resort Airlines. The largest single aircraft investment was in 16,500 shares of Lockheed with a market valuation of $627,000.

Grumman was next with 20,000 shares valued at $535,000. The largest individual airline commitment was in 10,400 shares of American preferred, with a market valuation of $829,400. Next were 30,000 shares of Eastern valued at $585,000.

►**Smaller Trusts**—Other specialized aviation trusts, but of smaller aggregate amounts, also exist within a broad group of funds sponsored by professional distributors and managers. These trusts are of the so-called mutual or open-end variety with a continuing source of capital provided by small investors.

The largest in this category is represented by the aviation class of Group Securities, Inc. It is difficult to follow the investment philosophy of this fund as it was liquidating aircraft and airline shares throughout 1950. The only significant additional purchases made during the six months ended Nov. 30, 1950 were 1000 Bendix, 4200 Eastern and 500 National.

During this same six-month period it disposed of, among other securities 10,300 Pan American, 2200 Grumman; 500 Douglas; 1500 Lockheed; 1000 North American Aviation; 2000 Sperry; 5800 Northwest Airlines; 400 Braniff and 500 United Air Lines. These liquidations took place before the subsequent sharp rise that developed in aviation equities.

As of Nov. 30, 1950 Group Securities' aviation holdings consisted of the following: 15,600 American; 2000 Bendix; 3100 Boeing; 11,100 Braniff; 10,000 Convair; 3000 Curtiss-Wright "A;" 2000 Douglas; 6200 Eastern; 13,000 Fairchild E&A; 8400 Grumman; 6000 Lockheed; 9000 National Airlines; 11,000 North American Aviation; 2200 Northwest Airlines; 6000 Piper; 6000 Republic; 6500 Solar; 2000 Sperry; 4500 United Aircraft; 10,000 United Air Lines and 1900 Western.

►**Early Liquidation**—New York Stocks, Inc. is another diversified group of investment funds having an aviation classification. Its shifts during the six months ended Nov. 30, 1950 also show liquidation in advance of the big rise that subsequently developed. For example, during the last half of its fiscal period, New York Stocks sold aircraft and airlines equities on balance in order to purchase 8000 Grumman. Its holdings as of Nov. 30, 1950 were represented by: 4600 American; 800 Bendix; 1000 Boeing; 2400 Convair; 500 Douglas; 2400 Eastern; 1000 Electric Boat; 8000 Grumman; 1200 Lockhead; 2500 North American Aviation; 500 TWA; 1200 United Aircraft, 1600 United Air Lines and 600 Minneapolis-Honeywell Regulator Co.

Another specialized trust, the aviation group of Institutional Shares, Inc., effected nominal adjustments in its portfolio during the last six months of its fiscal year ended Nov. 30, 1950. For example, it sold 500 Boeing; 150 Douglas; 1400 Grumman; 200 Republic and 100 United Aircraft. Purchases consisted of 300 Convair; 200 Fairchild E&A; 200 Lockheed; 100 North American and 100 Solar.

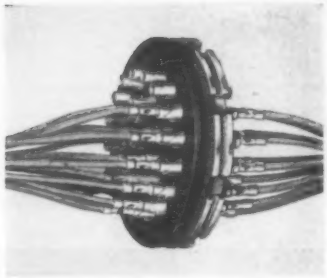
As of Nov. 30, 1950 its portfolio consisted of: 9400 American; 2700 Boeing; 1400 Capital; 4500 Convair; 1200 Douglas; 1900 Eastern; 4000 Fairchild; 2000 Grumman; 3200 Lockheed; 2600 Martin.

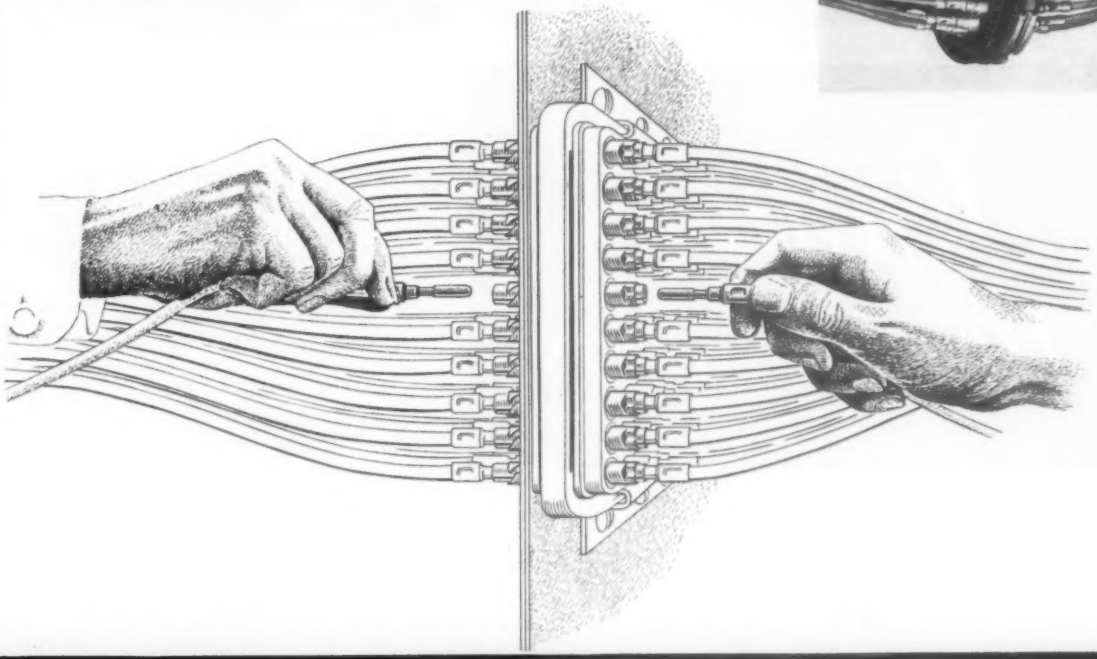
Also 5300 North American; 2600 Northrop; 1700 Northwest; 2600 Pan American; 4800 Republic; 1300 Solar Aircraft; 1300 TWA; 2300 United Aircraft; and 2600 United Air Lines.

An examination of these specialized aviation trusts reveals the complete lack of unanimity in their selection of investment commitments. Moreover, the action of a number of these groups indicate that both their selections and timing leave much to be desired to qualify as specialists in aviation securities.

—Selig Altschul

for electrical connections through pressurized bulkheads





disconnect
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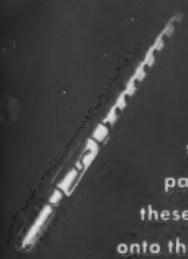

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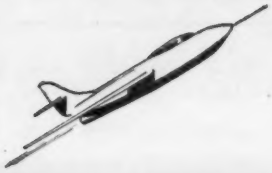
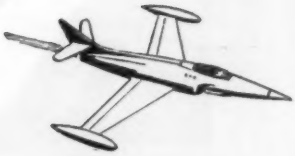


Ignition Headquarters



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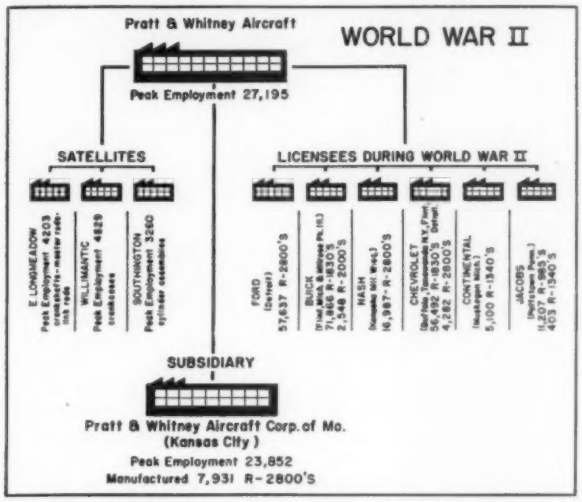
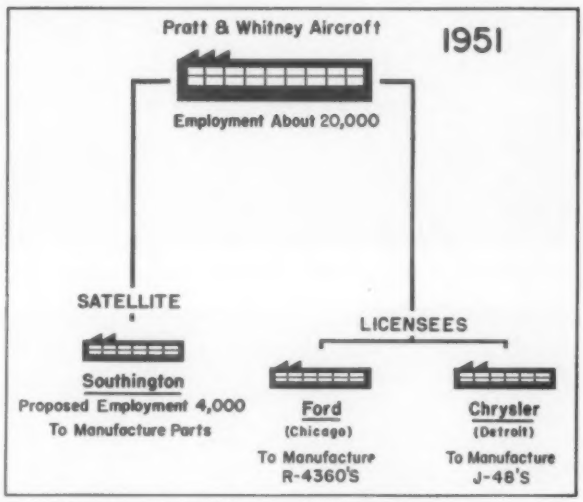




PRATT & WHITNEY EMPLOYMENT of 20,000, rapidly climbing, is still under World War II peak of 27,000.

Mobilization Stirs Up Wasps' Nest

P&W's rapid restoration of Southington plant shows speed it can apply in switch to all-out production.

By Irving Stone

Pratt & Whitney Aircraft has rushed through the talking stage and is well into the doing phase of its production expansion to cope with the stiff demands of the national emergency.

A major move in the expansion pattern already has been made. The company has taken over, rehabilitated and begun operating the Southington, Conn., 555,000-sq. ft. U. S. Government-owned plant which had been vacant since just after V-J Day.

▶ **Southington's Job**—The facility takes over P&WA's engine overhaul department, moved from East Hartford, to make room for expanded jet-engine production. It will overhaul all current and non-current production engines from the R-985 up through the J-42, a few J-48s for the experimental department, and Hamilton Standard division products, including props and governors.

The Southington operation won't stop at overhaul. It will manufacture piston engine components. Making of jet parts is not contemplated now, but these may be fabricated at Southington if the conditions of the emergency become sufficiently stringent.

▶ **Fast Schedule**—The speed with which the East Hartford-Southington move is being accomplished is a good indication of how P&WA is readied to meet wide expansion. On Oct. 1, 1950 it took over the Southington plant, which was badly in need of repair, both internally and externally. By Jan. 3, 1951 the facility was sufficiently rehabilitated to begin the moving operation from East Hartford. Ten days later the engine overhaul department had been installed and was in complete operation.

On Jan. 15, movement of the crankcase fabricating line was begun. Five days later it was in full operation with a battery of about 85 machines. Beginning Jan. 29, the cylinder barrels, tappet guides, pistons and muff departments were moved, and they were in high gear by Feb. 5.

By May, the entire facility will be in operation and well under way for accommodating a target force of 4000. Peak employment in World War II was about 3300, when P&WA operated Southington solely as a cylinder assembly plant. But now the operation is more complex and covers a conglomeration of many processes.

▶ **Moving Efficiency**—Recently, this writer witnessed an impressive demonstration of how efficiently P&WA is geared for expansion changes. Arriving at the Southington plant, machines mounted on skids were towed off the trucks by bulldozers, rapidly pulled across the factory and spotted roughly at floor placement marks numbered to correspond with the specific machines.

At this location the bulldozer was unhooked from the machines and, swinging around in front, nudged them into place much like a cat pushes a kitten around. Two men with crowbars followed to edge the machines into exact location in a couple of seconds. A crew of millwrights, electricians and plumbers were at the site to begin the hookup operation at once.

The speed and precision of this bulldozer spotting operation was such that two of these prime movers scurried between truck and floor location to spot small machines at the rate of about 1 every 3 min. Large machines require a spotting time of about 8 to 10 min.

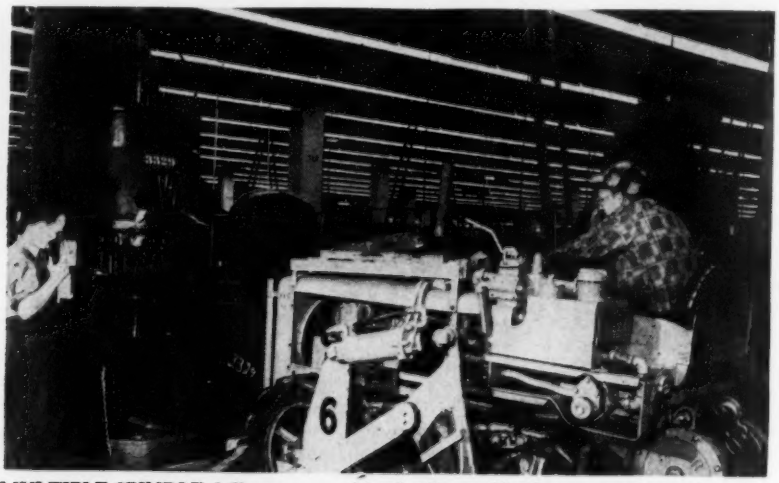
▶ **Little Time Lost**—Moves were planned so that a machine would not be out of operation for more than 24 hr. Thus, 12 heavy crankcase department machines that left East Hartford in the morning were set up and operating that same afternoon at Southington.

Engine parts that had been begun at East Hartford were moved along with the particular machine and completed at the Southington plant. And when convenient, the machine operator went along with the job.

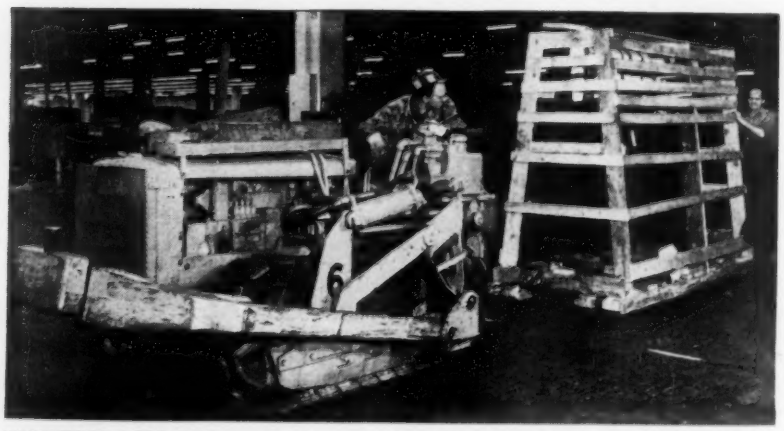
About 1200 machine tools are involved in the move. About 225 of these are units from war surplus and other sources.

▶ **Then and Now**—Obviously the Southington operation is just the beginning

NUMBERS painted on the floor of Southington plant show where equipment such as . . .



MULTIPLE SPINDLE drill press goes. After leveling and hook-up, operations wait on . . .



ELECTRIC CONTROL panels being set in place. The whole thing takes a couple of hours.

of the expansion program. How is P&WA going to spread its operations from this point on?

The answer may be surmised by a comparison of its production facilities in the last war with those it has at this incipient expansion stage.

In the last war, P&WA operated its main plant at East Hartford and a subsidiary at Kansas City for fabricating new production engines. Three satellite plants, of which Southington was one, manufactured parts for these engines. Six licensees (auto and aircraft engine builders) produced current engines for the company.

Now, there is the East Hartford plant, primarily for assembly and parts manufacture; the Southington satellite; and but two licensees presently scheduled, one for piston engines, one for jets. The main plant has an employment now of about 20,000 and is climbing at the rate of about 50 per day. This is still under the plant's peak force—more than 27,000 in the last war.

The former satellite plants are no longer available and it is unlikely that any others will become available in the vicinity of the main plant. The Kansas City plant is also unavailable. Licensing undoubtedly will be extended. But this will not be enough.

▶**Glimpse Ahead**—If United Aircraft management, which always has anticipated government planners in industrial mobilization, decides that the creation of production facilities must be accelerated, it is likely to move ahead on its own and wait for government schedules to catch up.

At East Hartford, about 25 percent of the production area now is devoted to jets. In terms of horsepower, this is equivalent to 30 percent of the total engine output. This jet production must necessarily increase substantially, and the high volume engine will be the J-48, since the Grumman F9F series is a major factor in the Navy program and the Lockheed F-94C will be a large item in the Air Force's procurement. Both these planes use J-48s.

▶**More Complication Now**—While there are fewer precision parts in the jet as compared with the piston engine, this is counterbalanced by the greater precision required. Result: at this stage of experience it requires about the same manhours per engine for the jet as for the piston engine, even though the production cost per horsepower is less for the jet. Later, in high volume, and with more experience, the jet production manhours will decline.

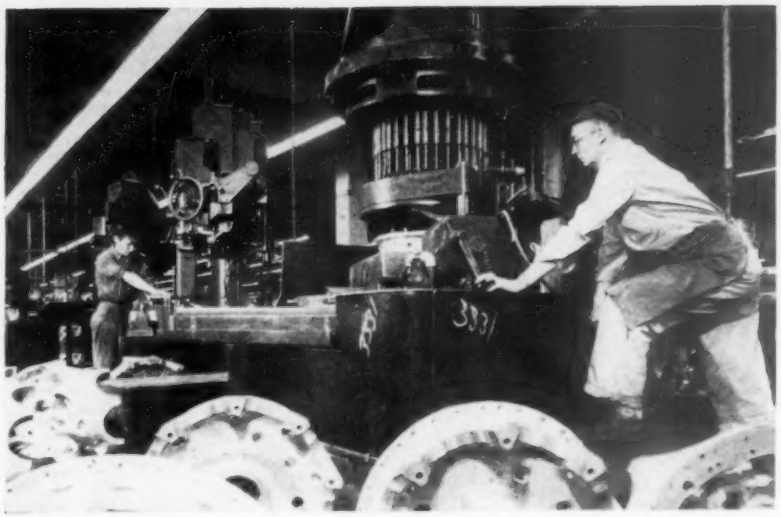
Thus, from the outward aspect, while the production picture seems not much different from World War II, the ramifications differ considerably. Then, there was only one basic type of engine—the piston plant. Now, P&WA has three basic types to offer—piston, turbojet and turboprop.

In addition, development is now proceeding along these three lines as against a single direction previously. And development is more intensive, forging ahead with bigger jumps and ranging into more untried phases.

Another difference is that greater performance advances will stem from engine internal design changes rather than from operational "nursing" procedures.

▶**Experienced Teams**—But P&WA is better prepared for the more complicated production task because of experience gained and the top level engineering, production and management personnel carried over from the last war, when three such teams were developed—one for East Hartford, another for the Kansas City plant, and a third for the satellite facilities.

To this has been added a fourth team, that has come up since the last



DRILL PRESSES were at work at Southington a few hours after leaving E. Hartford.

war, to pilot the Southington operations headed by 32-year-old Leefe Doty.

When it is remembered that P&WA (and its licensees) in the last all-out effort produced almost half the aircraft engine horsepower for U. S. military planes, with a comparatively small personnel nucleus stemming from the East Hartford operation, the company's present expanded experienced-personnel base indicates a far greater output potential than was previously possible.

▶**Material Complication**—As in other phases of the industry, a critical factor in P&WA's scheme for expanded production is material procurement.

Though this is beyond the company's direct control, it is a situation which must be licked if production is to be shifted to high gear.

Lead time (actual time elapsed from receipt of purchase order request to time of delivery) for numerous finished parts, raw materials, and other equipment has jumped considerably, from already extended periods, in the past six months.

Lead time in days for some of these common items are: hose clamps, 90 (was 60); cotter pins, 90 (was 30) safety wire, 150 (was 60); filters, 120 (was 90); flexible metal hose, 120 (was 90); aluminum forgings, 180 (was 120).

The lead time on many of the company's items has doubled in the past six months.

▶**Women for Jets**—Stockpiling of personnel is a far less critical problem. As in the last emergency, women are being drawn to fill the gap which will inevitably be created. P&WA is not picking them indiscriminately, but is shooting for those with machine shop or sheet metal experience.

On piston engines, women are doing pretty much the same job as before, but the trend is toward heavier and more exacting work.

In the jet arena, with its greater proportion of sheet metal work, women fit the production scheme more effectively. Jobs are easier to handle, are less complicated and involve considerable repetitive operations.

USAF Awards

Air Materiel Command Procurement Division makes available to AVIATION WEEK recent bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention: MCPPSX72.

ABSTRACTS

For nut assemblies (51-959):
Elastic Stop Nut Corp., of America, Union, N. J., on a bid of $184,192.74.

For dummy loads (51-1002):
Antenna Research Laboratory, Inc., Columbus, O., on a bid of $9475.50.

For bolts (51-1052):
Aircraft Hdwe. Mfg. Co., Inc., New York, on a bid of $142,545.90.

For battery testers (51-954):
Heyer Products Co., Inc., Belleville, N. J., on a bid of $13,175.

For 522 thermostats (51-998):
Montgomery Bros., Seattle, on a bid of $3348.66.

For valves, bracket assemblies (51-1000):
National Machine Products, DBA Ellinwood Industries, Burbank, on a bid of $13,580.

For ladders (51-1009):
Companies sharing: Griffith Mfg. Co., Malden, Mass., on a bid of $5541.95, and Los Angeles Ladder Co., Los Angeles, on a bid of $6751.95.

For portable coolers (51-1067):
Keco Industries, Inc., Cincinnati, on a bid of $759,924.

For aircraft fabric (51-1091):
Goodyear Tire & Rubber Co., Inc., Akron, on a bid of $5756.98.

For transformers (51-1149):
Weston Electrical Instrument Corp., Newark, N. J., on a bid of $3486.04.

For connectors (51-1156):
Companies sharing: Tolley Engr. Co., Clarksburg, W. Va., on a bid of $1368; Cannon Electric Development Co., Div., Cannon Mfg. Corp., Los Angeles, on a bid of $5215; Peerless Radio Dist., Inc., Jamaica, N. Y., on a bid of $1309.70, and Breeze Corporations, Inc., N. Y., on a bid of $2100.

For press-arbor (51-1193):
Companies sharing: Dake Engine Co., Grand Haven, Mich., on a bid of $878.15; Famco Machine Co., Racine, Wisc., on a bid of $892; Lempco Products, Inc., Bedford, O., on a bid of $244; Manley Div., American Chain & Cable Co., Inc., York, Pa., on a bid of $5127.24, and U. S. Pipe & Mfg. Co., San Francisco, Calif., on a bid of $240.

For starters (51-1194):
Jack & Heintz Precision Industries, Inc., Cleveland, on a bid of $228,322.65.

For heaters (51-1197):
Surface Combustion Corp., Toledo, O., on a bid of $1,316,778.75.

For 306 cable assemblies (51-1290):
Brad Harrison Co., Oak Park, Ill., on a bid of $64,712.88.

For indicators (51-1292):
Western Electrical Instrument Corp., Newark, N. J., on a bid of $81,000.

For pitot static system testers (51-1305):
Aircraft Products Co., Clifton Heights, Pa., on a bid of $11,439.

For oxygen system (51-696):
Companies sharing: Rice-Stix Inc., St. Louis, on a bid of $224,448; Chicago Show Printing Co., Mystik Adhesive Products Div., Chicago, on a bid of $1,024,764.00, and Minnesota Mining & Mfg. Co., St. Paul, Minn., on a bid of $108,555.

For cans (51-476):
Companies sharing: Protectoseal Co., Chicago, on a bid of $32,340, and Eagle Mfg. Co., Wellsburg, W. Va., on a bid of $2445.70.

For filters (51-453):
Companies sharing: Acme Metal Die, Inc., Los Angeles, on a bid of $33,138.58, and Neptune Electronics Co., New York, on a bid of $74,460.

For saw blades (51-820):
Companies sharing: DoAll Cincinnati Co., Cincinnati, on a bid of $48,571.50; John L. Fowle Co., Woburn, Mass., on a bid of $6540; Armstrong Hardware Supply Co., New York, on a bid of $300; E. C. Atkins & Co., Indianapolis, on a bid of $67,200; Armstrong-Blum Mfg. Co., Chicago, on a bid of $52,080, and William Dixon, Inc., Newark, N. J., on a bid of $1000.

For 65 cooling cabinets (51-933):
McIntyre Engineering Co., San Francisco, on a bid of $13,480.35.

For field maintenance shelters (51-824):
Rae Columbus, Inc., Columbus, O., on a bid of $45,782.

For gloves (51-641):
Companies sharing: Olympic Glove Co., Inc., New York, on a bid of $23,284.25, and Sager Glove Corp., Chicago, on a bid of $15,670.

For receiver transmitters (51-316):
H. M. R. Electronics, Inc., New Canaan, Conn., on a bid of $40,920.

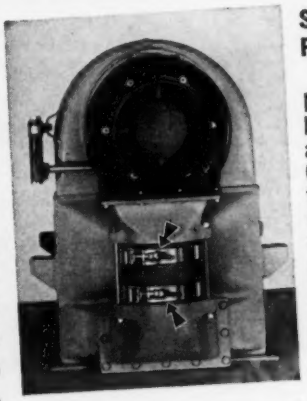
For acids (51-394):
Companies sharing: Standard Products Co., Philadelphia, on a bid of $7327.38; Octagon Processing, N. Y., on a bid of $23,200; Arthur S. LaPine & Co., Chicago, on a bid of $27,001.93, and Cole Laboratories, Inc., New York, on a bid of $2029.54.

For connectors (51-447):
Companies sharing: East Coast Electrical Supply Co., Inc., New York, on a bid of $1967.76; Selectar Industries, Inc., New York, on a bid of $395.20; American Phenolic Corp., Chicago, on a bid of $3963.40, and Kings Electronics Co., Inc., N. Y., on a bid of $18,314.

For connectors (51-609):
Companies sharing: American Phenolic Corp., Chicago, on a bid of $4583.10, and Howard B. Jones Div., Cinch Mfg. Corp., Chicago, on a bid of $1810.32.

For bushing (51-729):
Companies sharing: Gaveco Laboratories, Inc., New York, on a bid of $20,-334.66; Dumont Aviation & Supply Co., Long Beach, on a bid of $3757; Aero-Marine Products Co., W. Los Angeles, on a bid of $19,350; Wichita Precision Tool Co., Inc., Kansas, on a bid of $1325; George K. Garrett Co., Inc., Philadelphia, on a bid of $1065; Air Associates Inc., Teterboro, N. J., on a bid of $2125, and Lee D. Thompson DBA, J. D. Tool & Engineering Co., Dallas, Tex., on a bid of $2865.

ENGINEER'S NOTEBOOK



Standard Design Clamp Saves Production and Design Time

The application of a Standard Marman Quick Coupler Clamp on hose connecting heat exchanger and turbine in a Strato Air Cooling Unit for aircraft, illustrates one of many uses for this versatile clamp. It is particularly suitable for removable equipment or accessories and ducts because of the unique design of the latch which provides instant removal and fast assembly.

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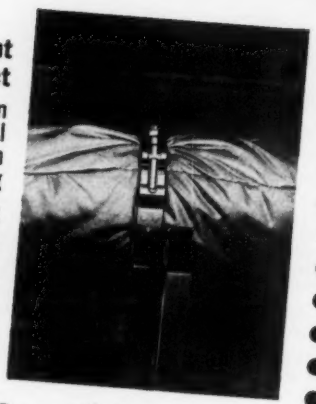
Standard design Marman T-Bolt Clamp with integral attaching angle provides an efficient means of anchoring duct to wing leading edge. Exclusive design features of Marman T-Bolt Clamps provide even circumferential take up and assure an efficient seal for all types of hose and duct connections.



Save cost and design time with Marman...

Standardized Clamps for Specialized Applications

1

For aircraft hardware (51-881):
Companies sharing: Searle Leather & Packing Co., Los Angeles, on a bid of $493.40; H. K. Metal Craft Mfg. Co., New York, on a bid of $1529.30; George K. Garrett Co., Inc., Philadelphia, Pa., on a bid of $605; Prestole Corp., Toledo, O., on a bid of $1674.75; Dumont Aviation & Supply Co., Long Beach, on a bid of $503.25, and Air Associates Inc., Teterboro, N. J., on a bid of $16,900.

For 340,600 pounds compound (51-909):
Wyandotte Chemicals Corp., Wyandotte, Mich., on a bid of $21,286.50.

AF Invitations to Bid

Bids opening are 20-30 days after approximate issue dates shown in the following bid proposals. Bid sets containing specifications for items to be procured will be sent to qualified applicants who write local field office, stating bid invitation number.

One bid set will be available for examination without obligation by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices. This will enable firms to see specifications before writing or telegraphing for their own bid sets.

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 39 S. La Salle St., Chicago 3; Wright-Patterson AFB, Dayton, Ohio; West Warren and Longo Aves., Detroit 32; 155 W. Washington Blvd., Los Angeles; 67 Broad St., N. Y. 4.

INVITATIONS

Tester assemblies, 1-4 items, bid invitation No. 51-1433, issue date 8 Feb., delivery 1st article within 60 days, balance within 60 days after approval of 1st article.

Roofing paper, 1-2 items, bid invitation No. 51-1445, issue date 8 Feb., delivery 50 percent within 60 days after date of award; 50 percent within 120 days after date of award.

Aircraft hardware, 1-29 items, bid invitation No. 51-1441, issue date 5 Feb., delivery 30 percent within 30 days; 40 percent within 60 days, and 30 percent within 90 days after date of award.

Ladders, 3045 each, bid invitation No. 51-1442, issue date 5 Feb., delivery starting within 60 days, complete within 60 days thereafter.

Dolly, 1-2 items, bid invitation No. 51-1443, issue date 5 Feb., delivery starting within 60 days, complete within 60 days thereafter.

Base assembly, 1-5 items, bid invitation No. 51-1436, issue date 5 Feb., delivery complete within 90 days after date of award.

Rubber matting, tape and tubing, 1-28 items, bid invitation No. 51-1440, issue date 5 Feb., delivery starting within 30 days, complete within 120 days.

Abrasive paper, 1-35 items, bid invitation No. 51-1439, issue date 5 Feb., delivery starting within 30 days, complete within 120 days after date of award.

Screws, 1-40 items, bid invitation No. 51-1435, issue date 5 Feb., delivery starting within 30 days, complete within 120 days after date of award.

Wire, 1-6 items, bid invitation No. 51-1431, issue date 2 Feb., delivery within 45 days after date of award.

Cable assemblies, 1-2 items, bid invitation No. 51-1429, issue date 2 Feb., delivery starting within 30 days, complete within 60 days.

Adapters, 10 each, bid invitation No. 51-1426, issue date 29 Jan., delivery starting within 60 days, complete within 90 days.

Drawing materials, 1-3 items, bid invitation No. 51-1420, issue date 29 Jan., delivery within 60 days.

Gloves and aprons, 1-14 items, bid invitation No. 51-1416, issue date 29 Jan., delivery beginning within 45 days, complete within 45 days thereafter.

TWO-PLACE Hornet grosses 900 lb., carries pilot and passenger over 50-mi. range.

COMBINED controls simplify Hornet flight.

CHANGING the 7-in. dia. engines is quickly done using only special screwdriver.

Ramjets Power Hornet Helicopter

Tiny Hiller craft, using two basic combined controls, shows excellent flight performance.

The Hiller-Hornet, a ramjet-powered helicopter, was given its first public showing the other day. But it won't be on the market soon because Stanley Hiller's factory at Palo Alto, Calif., is devoted exclusively now to filling military orders for his 360 Hillercopter.

If production could proceed at this time, Hiller had planned to market the little copter for under $5000.

▶ **Three-Year Old**—Hornet came off the board in 1948; by April 1950 an experimental model and one production model had been built, and parts for eleven more had been ordered.

Power to drive the rotor comes from two little ramjet engines mounted at the rotor blade tips. These units, each weighing 11 lb., deliver 31 lb. of thrust each. Ramjet diameter is about 7 in.

Engine change can be made in about 3 min. using only a screwdriver.

Engines were developed as the result of an intensive research program conducted "for several years behind closed doors."

The claim is made that these engines are . . . today the most efficient ramjet power plant yet achieved.

▶ **Engine Starter**—A two-cylinder gasoline engine, of the power lawnmower type, delivers about 1 hp. to the main rotor for starting. After the blades are turning about 150 rpm, ramjet ignition is started.

Ordinary automobile gasoline is used, but the engines have been designed to run on cheaper fuels.

Two basic combined controls fly the Hornet. The pilot uses his right hand to operate the overhead cyclic pitch control, and his left hand works a combination of throttle, collective pitch and rudder control.

▶ **Not So Big**—The Hornet has a gross weight of only 900 lb., of which 340 lb. represents empty weight. Rotor diameter is 23 ft., overall height, 7 ft.

Initial rate of climb is 1100 fpm., and service ceiling is 12,000 ft. Cruising velocity is 70 mph. and the present tankage—37 gal.—is enough to provide a 50-mi. range for pilot and passenger.

More Briefs From IAS Sessions

This is the third and last installment of digests of papers given at the 19th Annual Meeting of the Institute of the Aeronautical Sciences in New York City, Jan. 29-Feb.1. (See AVIATION WEEK, *Feb. 5 and Feb. 12, for other summaries.)*

STRUCTURES

▶ **An Impulse-Momentum Method for Calculating Landing Gear Impact Conditions in Unsymmetrical Landings**—R. T. Yntema and B. Milwitsky, Langley Aeronautical Laboratory, NACA.

A brief review of the landing process is made, and the importance of the unsymmetrical landing condition is considered. A simple impulse-momentum method, that takes account of approach conditions and airplane geometric and inertia characteristics, is given for calculating landing-gear contact conditions for successive impacts in unsymmerical landings.

Calculated results for a large airplane are used to compare the severity of landing-gear impacts in unsymmetrical and symmetrical landings, and to show the effects of such factors as sinking speed, wing lift, and side-drift on impact severity in the unsymmetrical case. The importance of landing-gear location and configuration is also shown by a comparison of the contact conditions for two similar airplanes—one having a conventional tricycle arrangement of gears and the other having a quadricycle arrangement.

▶ **Allowable Compressive Stresses in Aircraft Structures**—B. E. Gatewood, Associate Professor of Mechanics, USAF Institute of Technology, and E. L. Williams, Curtiss-Wright Corporation.

This paper shows procedures for determining the allowable buckling and maximum compressive stresses in both elastic and plastic regions for structural materials for which compressive-strain curves are known. In particular, curves are shown that are applicable for aluminum and magnesium alloys.

Detail procedures for obtaining the allowable compressive stresses in both the elastic and plastic regions are indicated for the following types of aircraft structure under compressive loads: Compressive buckling of flat plates; compressive maximum of flat plates; shear buckling of flat plates; bending buckling of flat plates; column stress for structural elements with stable cross sections (no local buckling); interrivet buckling of flat plates; compressive buckling of formed and extruded sections with local instability, compressive maximum or crippling of formed and extruded sections with local instability, column stress of formed and extruded sections with local instability, bending buckling of formed and extruded sections with local instability, bending maximum of formed and extruded sections with local instability, compressive buckling of flat plates with stiffeners, compressive maximum of flat plates with stiffeners, and column stress of flat plates with stiffeners.

▶ **Some Results of Sweptback Wing Structural Studies**—A. L. Lang, Engineer, Aero-Elastic and Structural Research, and R. L. Bisplinghoff, Associate Professor of Aeronautical Engineering, Massachusetts Institute of Technology.

Static stress and deflection tests have been conducted in the laboratory on a 45° sweptback single-cell beam. Results of these tests are compared with simplified theories for predicting stresses and deformations in sweptshell beams. The agreement between theoretically and experimentally determined deflections is closer than the stresses, but both agree within acceptable engineering accuracy.

Both cases of skewed ribs and ribs perpendicular to the spars are included. The concentration of normal and shear stresses at the root of the rear spar and the coupling between bending and torsion are discussed. Since some degree of root support deformation is unavoidable in sweptback wing static tests, a method is described of accounting for this effect in the theory.

▶ **Buckling from the Standpoint of Dynamics**—N. J. Hoff, Head, Department of Aeronautical Engineering and Applied Mechanics, Polytechnic Institute of Brooklyn.

This paper is a report on an investigation undertaken to clarify details of the process of buckling of columns compressed in testing machines. Behavior of the column was analyzed by means of dynamic equations of motion, and the results were compared with oscillograms obtained in column tests. The major result of the investigation is that the maximum load recorded in a column test need not necessarily be the same as the theoretical instability load. Moreover, the buckling process of inelastic columns differs radically from that of elastic columns.

FLIGHT SAFETY

▶ **Some Special Aspects of Air Transport Safety**—C. Christianson, Flight Safety Engineer, United Air Lines, Inc.

The aviation industry has learned that accidents in scheduled transportation can be eliminated. This is not idle speculation. It is adequately supported by trends presently existing within the framework of scheduled air transportation. The most singularly effective rule to be followed in accomplishing the no-accident goal is eliminate exposure to the accident before it happens.

Several years ago during an accident investigation, a top leader of the industry asked when several individuals were sharpshooting the principles of the investigation: "Where were all the 'experts' before this accident happened?" This question exposed a serious problem that has long been a stumbling block in the progress toward fundamental safety. If we can expert the cause of an accident, then it is not beyond our capacity or intelligence to expert the cause before it happens and thereby prevent it. The technique of determining accident causes is well established. If we are willing, we can apply the same initiative and technique in discovery of the exposure.

▶ **Comparative Significance of Transport Safety Statistics**—R. Modley, Research Consultant, Research Aircraft Industries Association.

The yardstick most commonly applied today in measuring aviation accidents is the number of passenger deaths per 100,000,000 passenger-miles. The major shortcoming of this standard lies in the fact that it omits disabling injuries.

This makes impossible comparative data showing the TOTAL effect and deaths AND injuries caused by any one means of transportation.

What is needed is a method by which both "death" and "injury" can be translated into a standard of measurement equally applicable to both.

Such a standard can be provided through the introduction of "life-years." These would provide a means of measuring the time lost due to loss of life and loss of time through disabling injury. The resulting data would make possible a correct measurement of total loss of life-years through scheduled air line, railroad passenger train, bus, passenger automobile, and taxi accidents.

▶ **Human Engineering for Air Safety**—Ross A. McFarland, Associate Professor of Industrial Hygiene, Harvard School of Public Health.

The safety record in scheduled air transport flying suggests that current research should be devoted to the subtleties of the problem, such as the prevention of near-accidents and the anticipation of new problems. The present paper will be concerned with analyzing the conflicting interests of the aircraft designer, the airline operator, and the air crews in establishing wider margins of safety. Emphasis will be placed on design problems relating to high-speed, high-altitude flying in current and future transport models.

AIR TRANSPORT

▶ **Some Meteorological Problems Indicated for Jet Transport Operation at 40,000 Feet**—H. T. Harrison, Jr., Manager of Weather Services, United Air Lines, Inc.

Analysis of available upper-air data reveals three weather factors that will most likely present flight planning and operating problems when jet transports are placed in service to cruise at 40,000 ft.: Clear air turbulence, high wind components, and extreme temperatures.

Present methods of upper-air chart analysis should prove satisfactory in predicting temperature changes at all levels, but turbulence and winds will require the development of new analysis and forecasting methods in order to permit realistic forecasts to be made at the flight-planning stage.

The Weather Bureau network of RAWINSONDE stations must be expanded to a point where wind observations at 40,000 ft. will equal the number of temperature-humidity reports, and all soundings should be increased to a frequency of four daily.

▶ **Distance Measurement Equipment (DME) for the Terminal Area**—Joseph Lyman and George B. Litchford, Aircraft Radio Research department, Sperry Gyroscope Co.

The accuracy requirements are reviewed for various distances from the airport and for the distance measurement required for final approach to the runway. This paper discusses techniques that will permit the measurement of distance to the necessary

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AVIATION EQUIPMENT

accuracy and at the same time requiring only the minimum radio frequency bandwidth.

The techniques described permit integration of the distance-measuring function with other radio guidance equipment such as a precision omnirange. This technique also permits a coarse and fine measurement of distance to be employed to get the required accuracies.

Intermittent continuous-wave techniques are described which permit time-sharing. A very short duty cycle is employed by each aircraft, thus allowing many aircraft to employ the system. The use of electrical memory of the rate of change of distance improves the DME and reduces the possibility of interference between multiple aircraft on the same radio channel to negligible values.

Reviewed are instrumentation techniques designed to present azimuth and distance information in an integrated form so that the pilot can employ the DME with other data for flying complex tracks in the terminal area.

▶ **General Aspects of Cabin Pressurization**—R. W. Rummel, Chief Engineer, Transcontinental and Western Air, Inc.

Analyzed are problems TWA has encountered since the inception of the Boeing 307s, and the various steps taken in correcting design deficiencies of pressurization equipment. The purpose of the paper is to reaffirm the design precepts for future transport aircraft, relating to the current-day problem those things that must be corrected in designing for the future. Dealt with are such problems as cabin compressors, control systems, window and door failures, and overhaul costs.

▶ **Fatigue Problems in Transport Aircraft**—W. T. Shuler, Chief, Structural Section, Airframe and Equipment Branch, CAA.

This presents factual information concerning operating times of modern transport aircraft and the incident of fatigue-type failures in the airframes of such craft. It is pointed out that airframe fatigue failures constitute a serious nuisance but usually do not offer a serious threat to airworthiness.

The Civil Air Regulations and International Regulations pertaining to fatigue are discussed, together with the administration of these regulations. Some of the types of fatigue problems occuring in service and the corrective and preventive measures taken are given. The conclusion is reached that fatigue-failure incidents can best be reduced by increased attention to detail design and that preventive maintenance supplemented by inspections is an available and effective means of assuring continued safe operation of new- and old-type transport aircraft.

ELECTRONICS IN AVIATION

▶ **Problems of Standardization of Electronic Equipment for Aircraft**—Charles R. Banks, Chief Engineer, Aeronautical Radio, Inc.

Problems of standardizing aircraft electronic equipment, a necessity in high-speed high-density aerial traffic and in precision aerial navigation, requires the coordinated effort of operational and technical planning. From the operation problems, the solution of which determine the operating specifications, four chief phases arise: (1) formulation of a system; (2) development of equipment; (3) design and manufacture of that equipment; and (4) installation in aircraft.

A system plan wherein technical characteristics are established from the operational requirements provides guidance for the development of electronic equipment to solve air traffic and navigation problems. Such planning and development provide the basis for the implementation and the use of each electronic device as it becomes available.

The design, production, and installation of the equipment in the aircraft are the steps in the transition from present methods of operation to a completely new electronic system of navigation and traffic control. It is the many mathematical problems to be solved by electronic means to meet the operational requirements of pin-pointed positions, known rate of aircraft closure with a destination, and computed courses and computed landing schedules that create the requirements for a vast number of electronic functions.

To implement the new electronic system, Banks says we must proceed from the newly formulated all-weather air traffic, air navigation operational standards through the technical developments to the design, manufacture, and utilization of equipment which must comply with established aircraft form factors and standards of primary power and uniform electrical characteristics. He contends we must utilize known good engineering practices and standards to assist the implementation of the program and apply a maximum of our effort to the new technical points of the common plan in order to ensure successful completion of the objective air traffic navigation system.

▶ **Packaging of Airborne Electronic Equipment**—Orville M. Dunning, Vice-President-Engineering, Hazeltine Electronics Corporation.

The enormous development of electronic equipment brought about by the war, with the attendant multiplied complexity has resulted in the abandonment of many old practices and in the proposal of numerous new and radical techniques in packaging. Some of these, together with the problems that they pose for manufacturer and user, are considered.

▶ **Airborne Antenna Problems**—Harald Schutz, Head, RF Engineering Section, The Glenn L. Martin Company.

Modern high-speed aircraft, piloted and pilotless, carry many types of electronic gear. Antennas covering a wide range of frequencies and capable of filling a variety of radiation requirements must be supplied.

At the same time, aircraft have been streamlined to aerodynamic perfection, and antennas may no longer protrude into the air stream. Stress analysis has progressed, and weight economy has forced utilization of the skin of wings and fuselage to carry load forces. Therefore, it becomes increasingly difficult to obtain permission to cut the skin. Wing thickness is reduced and inside space utilized for structural members, controls, fuel storage and armament. Space for antennas is hard to find.

A compromise between justified requirements of air-borne antennas and of aircraft to carry them aloft must be achieved. Areas of mutual understanding between aircraft and antenna engineers must be created.

Airborne antenna design makes use of practically all known antenna types. Complicated mechanical scanning mechanisms, dipole and slot antennas, helical antennas, polyrods and arrays of radiating elements, lens structures, electromagnetic horns, and many other types are being continually improved and adapted to airborne use.

▶ **Frequency Allocation for Aviation Electronics**—Edwin Lee White, Chief, Safety and Special Radio Services Bureau, Federal Communications Commission.

The number of applicants for radio channels still exceeds the number available. Those considering new uses for radio must take this unfortunate circumstance into consideration. Further, those using radio and those developing new apparatus to operate on frequencies already alloted must explore every avenue to ensure that their portion of the spectrum is used most effectively.

In the field of operational practice, this means adoption of efficient operating procedures so that the maximum of ideas may be passed with the minimum of channel time. Every means should be taken to avoid the use of radio when other means will serve.

It is concluded that there is no prospect of satisfying all demands. Under such circumstances, the best engineering techniques must be initially applied to reduce spectrum occupancy, and research must continue to develop new methods of frequency economy so that the needs of expanding industry can be met.

Titanium Structural Efficiency Studied

A further contribution to the technology of titanium has been made by the National Advisory Committee for Aeronautics.

Theoretical analyses of the structural efficiency of the new metal have been published recently in NACA Tech. Note 2269, "A Structural-Efficiency Evaluation of Titanium at Normal and Elevated Temperatures," by George J. Heimerl and Paul F. Barrett, Langley Aeronautical Lab, Langley Field, Va.

▶ **Comparison Made**—Commercially pure titanium was compared to extruded ZK60A magnesium alloy, extruded 75S-T6 aluminum alloy, 24S-T3 aluminum alloy and stainless W. Structural conditions considered were for compressive loading without buckling, for column buckling and for the buckling of long plates in compression or shear.

The methods of evaluation were based on the use of stress-strain curves and structural indices. Comparisons were made at normal temperatures (80 F.) and at elevated temperatures up to 600 F., although the latter were limited because of available data.

A further limitation in the elevated-temperature considerations was that only short-time loading and exposure

conditions were analyzed.

▶**Compressive Loading**—When there is no buckling and compressive strength is the criterion, the efficiency of any structural material may be taken as the ratio of compressive yield stress to density. On this basis, 75S-T6 is the most efficient of the available materials at normal temperatures, with titanium and stainless W following in that order.

At 400 F., 24S-T3 is most efficient, followed by titanium and 75S-T6.

At 600 F., titanium is considerably more efficient than the aluminum alloys.

If structural stiffness is the criterion, and again limiting the case to one of no buckling, the modulus-density ratios can be taken as the measure of efficiency. On this basis, there is little choice among the materials at 80 F. But at 600 F., titanium is more efficient and is less affected by heat.

If a small amount of distortion of the structure is the criterion, still considering no buckling, then curves of the stress-density ratio against the strain can be interpreted directly as measures of efficiency. For this case, extruded 75S-T6 is the most efficient, with titanium next. At 400 F., 24S-T3 sheet tops the list, while at 600 F., titanium takes first place.

▶**Column Buckling**—In a structure where column buckling is the criterion, extruded 75S-T6 is the most efficient material at 80 F., except for some limited cases where extruded ZK60A magnesium alloy is slightly better.

At 400 F., 24S-T3 is most efficient.

At 600 F., titanium is far more efficient than the aluminum alloys.

For long plates loaded in compression or shear, where plate buckling is the important consideration, the magnesium alloy tested was most efficient at 80 F. At 400 F., the 24S-T3 sheet and extruded 75S-T6 are both better than titanium.

At 600 F., titanium shows up much better than the aluminum alloys.

▶**The Hotter, The Better**—The interesting thing to note here is that pure titanium is more efficient than the aluminum alloys at elevated temperatures, on a short-time basis. And for normal temperatures, this condition is reversed. Note, too, that stainless steel was not considered at the elevated temperatures, and that 600 F. was the top limit of temperature.

The NACA engineers observe that if the compressive yield stress of titanium, or its alloys, could be increased to about 130,000 psi., it would compare more favorably with high-strength, lighter alloys at normal temperatures for compressive loading without buckling. But it still would not beat the lighter alloys for column and plate buckling designs.

A substantial increase in modulus-

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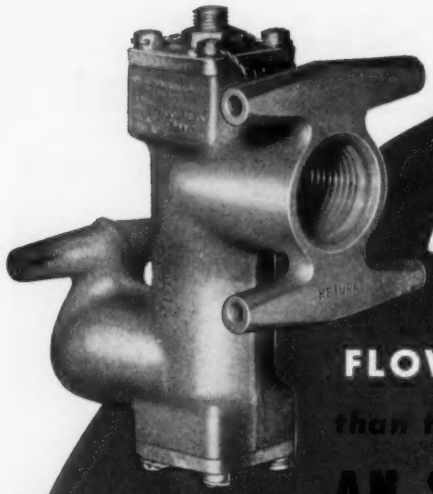
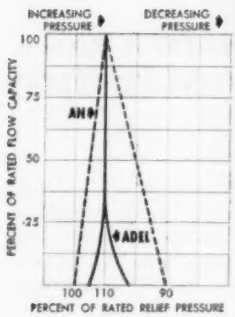


100% to 400%
GREATER
FLOW CAPACITIES
than those required by
AN STANDARDS!

ADEL 3000 PSI POPPET type RELIEF VALVES

¼", ⅜" & ½" line sizes are QPL equipment per MIL-V-5523



FLOW CAPACITY DATA (gpm)

	LINE SIZE			
	¼"	⅜"	½"	¾"
AN Standard	1.2	3.5	6	16
ADEL	6	10	14	32

ADEL 3,000 psi Class CD poppet type relief valves provide maximum flow capacity for a given line size. All conform strictly to AN 6279 Envelope. Extremely compact, light weight construction permits savings in weight of up to twice that of competitive valves. Zero internal leakage requirements are met at a pressure 30 psi less than dynamic cracking pressure, and 30 psi less than dynamic reseating pressure as defined by MIL-V-5523. Pressure variation from cracking point to maximum rated capacity is far less than that required by AN standards.

Make comparisons and see for yourself why these outstanding valves are unexcelled for high pressure aviation hydraulic performance.

ADEL also produces the most complete line of AN Standard aircraft Clips and Clamps available.

For complete engineering specifications and counsel, address: ADEL DIVISION, GENERAL METALS CORPORATION, 10775 Van Owen St., Burbank, Calif.

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Manufacturers of Aircraft Hydraulic Control Equipment

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density ratio would be necessary in order to have titanium competitive with the lighter alloys for the conditions of plate buckling. And, says the NACA, such an increase is improbable.

Boeing to Switch to School's Windtunnel

Boeing Airplane Co. has reached an agreement with the University of Washington which gives the company priority on use of the university windtunnel, while its own undergoes a two-year $1.5-million modernization.

In return, Boeing has agreed to pay $20,000 to soundproof the interior of the university tunnel and to install a new balance system to provide improved methods of model testing. Should these improvements require further funds, Boeing will make advances up to an additional $20,000 as prepaid rent, under an agreement announced jointly by Prof. Fred S. Eastman, head of the university's aeronautical engineering department and director of the university's aeronautical laboratories, and George S. Schairer, Boeing staff engineer in charge of aerodynamics and power plants.

More than 25 percent of university windtunnel operations during the past two years have been in connection with Boeing projects, said Schairer.

Robert Joppa, windtunnel supervisor, and Louis Gratzer, research associate, both of the University's aeronautical engineering staff, will design the new balance system, which will include a removable pedestal for the models.

Fog-Freeze Resistant Fighter Windshield

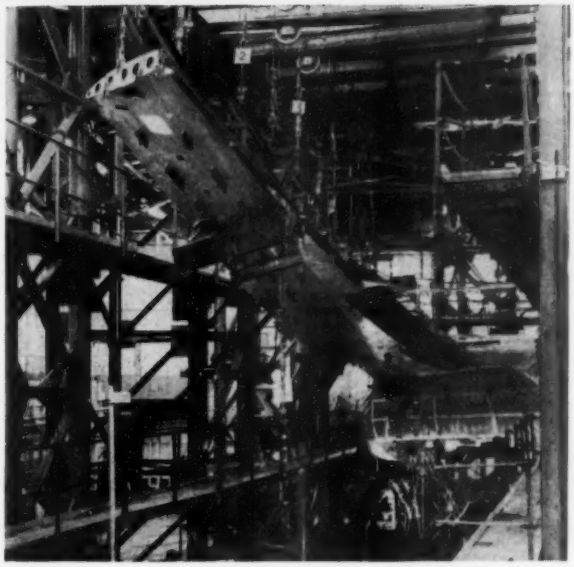
A new electrically heated windshield is being incorporated in the Northrop F-89 Scorpion all-weather interceptor now in production at Northrop's Hawthorne, Calif., plant.

The windshield is built of Electrapane, a special glass construction designed with three primary favorable properties:

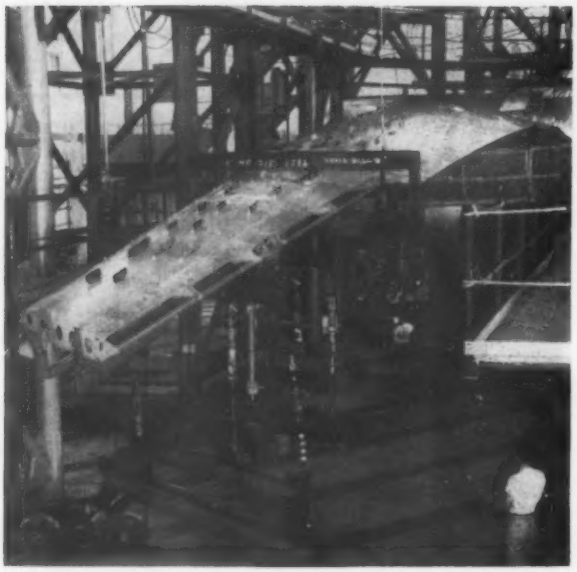
- **Fog or freeze resistant** in any weather conditions.
- **Bullet resistant.**
- **Serve as a gunsight reflector.**

Libbey-Owens-Ford Glass Co. engineers who developed the windshield say it is the first successful combination of these three characteristics in a fighter windshield.

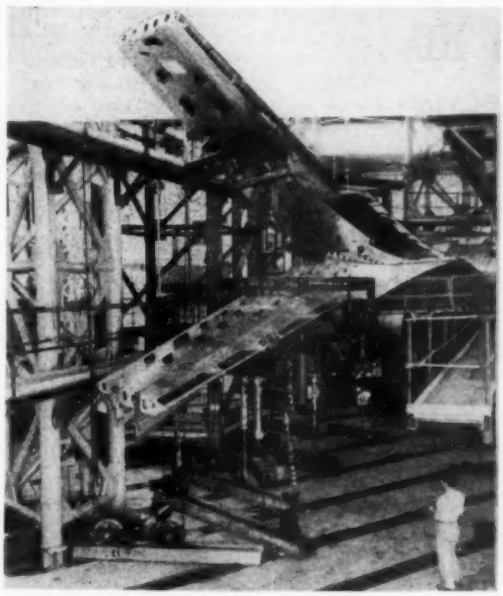
The shield is an inch and a half thick. Electric heating is accomplished by circulating electric current across an invisible oxide film which coats the inside of the glass. Electrodes at the edges transmit the current to the film.



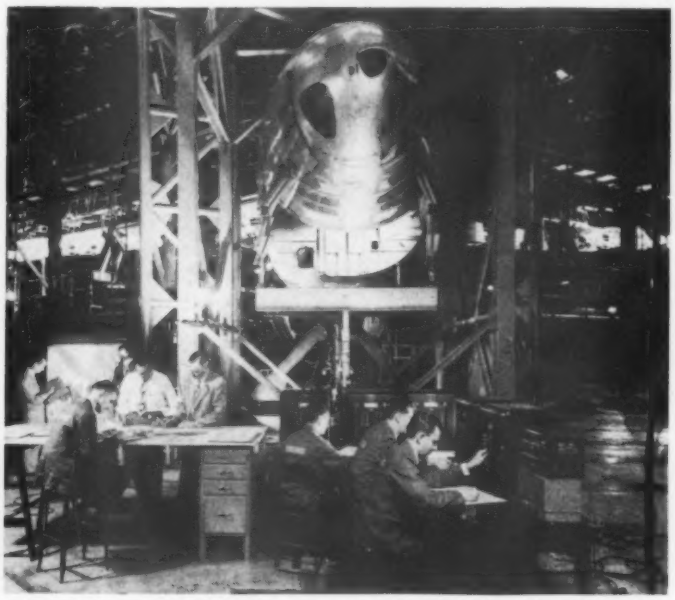
GOING UP over 11 ft. is this B-47B wingtip during static tests of the complete airframe. The extreme flexibility of the wing structure is emphasized in this type of test which simulates high-g wing loadings due to pullout or gust. Note fuselage wrinkles.



GOING DOWN for 6 ft. or more, the B-47B wing flexes well beyond any normal flight deflection. Hydraulic jacks, cables below wing fasten to surface adapters similar to those showing on upper surface to transmit loads to wing structure.



COMPOSITE PHOTO shows combined upward and downward deflections of B-47B wing during static tests at Wichita. Total arc shown here is 17 ft., later overload tests increased this to over 20 ft.



DOWN BY THE NOSE of the Stratojet being static-tested is this group of recording boards and strain indicators. These remote-reading devices provide central data-gathering points where engineers and technicians can watch the progress of tests while they plot wing strength.

Static Tests of Boeing's Stratojet

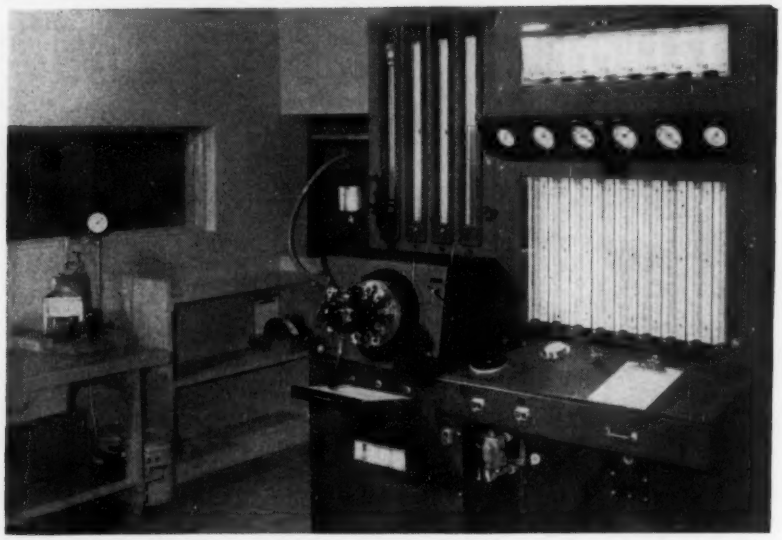
Structural tests of the B-47B Stratojet, started last June, have just been successfully completed at Boeing Airplane Co.'s Wichita, Kan., division.

Although more than 100 different tests formed the program, by far the most spectacular were the wing strength tests.

In these, the wingtip deflected upward more than 14 ft., and downward more than 6 ft.

More than 700,000 lb. of structural steel went into special fixtures and scaffolding to support the test aircraft. Loads were applied by cables actuated by hydraulic jacks.

The test airplane was one which had been completed ahead of schedule without engines, flight equipment, controls and accessories to save time in the detection and application of any needed design changes.



EAL'S CARBURETOR and fuel injection pump overhaul shop. Pump test stand at right.

EAL Curing Engine, Injection Ills

Close attention to details, surgical cleanliness are factors in reducing power plant failures.

By George L. Christian

(Second of a two-part series on Eastern Air Lines' Miami overhaul base. First story appeared Feb. 5.)

Miami—Meticulous attention to detail of engine overhaul is reducing Eastern Air Lines' engine failure rate sharply, according to J. S. "Tony" Pitisci, engine overhaul superintendent.

Backing up his statement, Pitisci said that EAL had not experienced a single engine failure attributable to the engine in over three months on the Wright R-3350BD-1 used on Constellations. This is equivalent to some 60,000 engine hr. The airline also operated a record one year and four days without a single failure on the Bendix-Stromberg R-3350 master control. Over 80 units were involved.

EAL's 49 DC-3s have operated six months without carburetor failure.

▶ **Injection Pump Failures**—Failure of R-3350 fuel injection pumps has been reduced from 75 in 1949 to 27 in 1950, primarily through careful inspection of all bearings used in the pump (bearings giving the slightest suspicion of roughness are rejected).

Another important contributing factor, according to E. J. Biesekerski, foreman of carburetor and fuel injection overhaul, was the EAL-developed steel tube insert in the aluminum housing of the fuel injection pump. Before the steel tubes were used, high fuel pressures would erode the relatively soft aluminum housings. An indication of the sharp reduction in pump malfunction experienced by EAL: More pumps failed in the single month of September, 1947, than in the entire year of 1950.

In the surgically neat carburetor overhaul shop, which resembles a laboratory more than a maintenance facility, Biesekerski pointed out some of the tricks of the trade that he and his crews have worked out to improve injection pump performance.

• **Close output tolerance.** Biesekerski stated that although a 7cc variation in output was permissible between two pumps mounted on the same engine, he kept his tolerance to ± 1 cc. and the output was set at the high end of the allowable scale. The manufacturer allows a variation of from 168 to 175 cc. per 500 strokes, he said. His limits are 173 to 175 cc. per 500 strokes. Result is less output discrepancy when two pumps are mounted on an engine.

Injection pump plungers and cylinders are measured with instruments of .000005 in. accuracy.

• **Leak elimination.** A couple of leaks bothered Biesekerski. One was at the diaphragm seal between the diaphragm retainer plate and the seal diaphragm washer assembly. Both metal parts were polished and when tightened together, the intervening seal squeezed out, allowing leakage. Corrective action: The flat diaphragm retainer plate was lapped on a lapping plate with a coarse compound. This roughed up the slippery finish and gave a true surface in one operation. Next, the seal retainer washer assembly was sandblasted to give it a toe-hold on the rubber. When the components were reassembled, the diaphragm was held in place by the coarse-surfaced parts and leaks ceased.

Identical treatment was given smooth surfaces of the pump bracket and the housing into which it mounts. The rubber gasket sealing this joint had the same squeeze-out tendencies which were stopped by roughing up the smooth parts it was to seal.

• **Slippage stopped.** Injection pumps had been thrown out of synchronization by as much as 10 percent because of slippage between the by-pass control lever and the control shaft assembly. Again coarsening the contact surfaces between these two originally smooth parts solved the problem; slippage and off-synchronization has been reduced to zero.

▶ **Random Observations**—Some observations around EAL's shops:

Engineers and maintenance personnel are pleased with the performance of the Bendix-Scintilla low tension ignition system and Champion R37S-1 sparkplugs on the R-3350 engine. They agree that the low tension system gives practically no trouble and the plugs have been eroding so little that EAL is requesting that the current 600 hr. overhaul period be extended to 700 hr.

The company is half way through converting its Connie engines to jet exhaust stacks. It says that speed increase is around 12 to 15 mph. at 20,000 ft. Cabin noise level has gone up three decibels. Passengers have commented on the flaming exhaust, but the passenger service department is informing them of the complete safety of the flames and that the modification results in an improvement of the aircraft.

EAL is service testing the Vickers, Inc., wafer kit (AVIATION WEEK Nov. 27, 1950) on two Vickers hydraulic pumps on one DC-4 and on two Pesco model 011227-010 new gear-type hydraulic pumps on another DC-4. To date 800 to 900 hr. have been accumulated on both installations. Hydraulic system noise and vibration levels have

been noticeably reduced on both aircraft and no trouble has been experienced with either system.

M. R. Cochrane's electrical overhaul shop has found an effective way of keeping noise level down. Moveable boxes paneled with Celotex soundproofing material have been made to cover generators when being checked out on test stands. The strident scream of a loaded generator has been reduced to a whisper. And greater working efficiency results.

The fuselage of one Connie is dressed up with Minnesota Mining's "Scotch Lite" tape whose reflective quality give interesting, irridescent effects, especially at night. The material has been on for a year and has held up extremely well. Main difficulty is breaking the plastic bond to get it off. Interesting sidelight: it is a good leak indicator on pressurized cabins, puffing up wherever a leak occurs.

Eastern Air Lines and Trans World Airlines exchange all engineering orders pertaining to Constellation aircraft.

Daily hourly utilization figures for EAL's fleet for the period Dec. 16-31:

- DC-3s—8:50
- DC-4s—10:35.
- Constellations—11:38.

Yearly payroll at the Miami base is $12.3 million and the purchasing department's bill runs a fat $25 million.

Solenoid Fuel Pump

An electric fuel pump, with a reported performance that should arouse interest of aircraft engineers as to its overall potential, is being produced by the Eclipse Machine division of Bendix Aviation Corp., Elmira, N. Y.

The result of five years study and development, the lightweight (1 lb., 13 oz.) and rugged pump operates through the plunging action of a solenoid. Bendix says it currently is being produced for the military services to supply fuel to heaters on vehicles operating in the Arctic. Bendix sees promising application of the pump to aircraft, although it was initially designed for automotive use.

According to the firm, it can be used for light aircraft carburetion, fuel injection systems and other fuel transfer needs. A single pump delivers up to 30 gph., while static pressures up to 7.0 psi. are obtainable.

Endurance tests conducted by independent laboratories and Bendix show this pump "has a life expectancy far greater than that of mechanical or electrue fuel pumps now in use."

All electrical components in the unit are hermetically sealed. Pumping is achieved by the movement of the hollow solenoid plunger which is controlled by an interrupter in the circuit. No sylphon or rubber diaphragm is used and a smooth steady output of fuel is maintained through a wide range of temperatures, Bendix says. Successful tests have been conducted at −75 F.

According to the firm, tests recently have indicated extreme low temperature starting of engines is limited by slow cycling of mechanical fuel pumps, whereas full fuel supply from the new unit permits starting "at appreciably lower temperatures."

Bendix says with the solenoid-pump, pressure buildup between fuel pump and carburetor are eliminated, and hot weather starting difficulties are removed. It points out the unit can be used as a pusher to eliminate vapor lock in fuel systems.

VERSATILE FIRE FIGHTER

Equipment packed in this $30,000 fire-truck covers the proverbial waterfront, including the "wet" type. In service at Seattle-Tacoma Airport, this versatile machine is capable of fast pick-up to 50 mph. fully loaded; will deliver water, "wet" water, foam, dry chemical or fog, separately or in combination through hand lines, turrets and low-level ground sweeps. Hand-operated foam and dry chemical extinguishers, floodlights, two-way radio and a portable resuscitator also are included. United Air Lines safety engineer, J. C. Curtis, says it's finest fire-fighting apparatus anywhere in UAL system.

HERE IS A NEW ANGLE TO LOOK AT . . .

Eight 6-ship Mul-T Buildings from International Steel bring revenue to the Miami Valley Flying Service at South Dayton Airport, Dayton, Ohio.

Since door openings are of the greatest importance in a hangar building, International engineers design doors to meet specific hangar requirements. For example, notice the exclusive Bi-fold Canopy door used on the International Mul-T hangar. Here, International eliminates all sticking, freezing, and wind or ice failure common to lightweight sliding doors. This same sound engineering thinking is carried through in the design of doors for large shop hangars.

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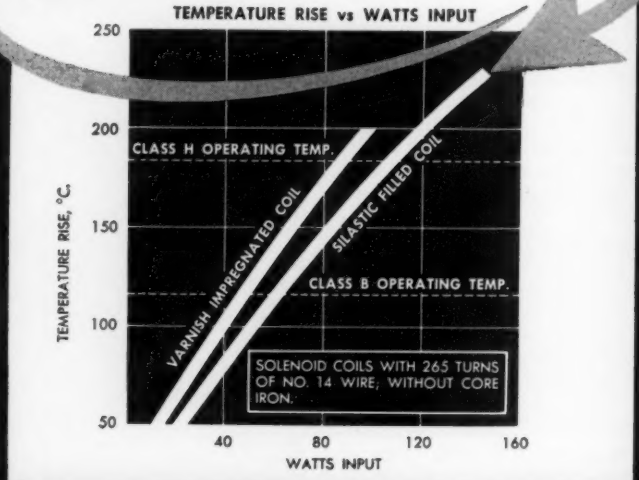
SILASTIC* the resilient dielectric, stable from -60° to +200°C.

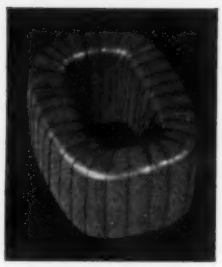


dissipates heat much faster than conventional insulating materials

Here's an insulating material that gives you all of the advantages of a rubberlike dielectric *at Class H temperatures*, plus extreme low temperature flexibility, plus about twice the thermal conductivity of conventional resinous or rubbery dielectrics! In a solenoid coil, for example (see graph above), Silastic gives 15% more capacity than resinous silicone insulation at 180°C. That's due to increased thermal conductivity alone.

Thermal stability plus high heat conductivity permit the Silastic coil to operate at 166% of the maximum capacity for an identical organic resin impregnated solenoid. Performance of over 1600 Silastic insulated main and interpole field coils in diesel-electric traction motors is further proof of the extraordinary advantages of Silastic as a dielectric.

In coils of all kinds, Silastic provides resiliency and relatively constant dielectric properties of temperatures ranging from below −60° to above 200°C., maximum resistance to corona, to electrical and mechanical fatigue and to abrasion, oil and outdoor weathering.



Silastic insulated solenoid has 166% of the capacity of identical Class B coil plus maximum shock, abrasion and vibration resistance over a span of 260 Centrigrade degrees from −60 to +200°C.

SEND TODAY! **For data on the properties, performance and applications for Silastic.**

(*T. M. Reg. U. S. Pat. Off.)

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'Ink-trace' Navigator Used in Brabazon

The "Flight Log," an automatic aerial navigating device and a version of the British Decca Navigator, has been installed in the gargantuan Bristol "Brabazon" and is going into quantity production, according to reports from England. Standard Decca units are installed in some thousand ships and aircraft.

The Flight Log, which resembles instruments under development in this country (AVIATION WEEK, Oct. 23), automatically shows the pilot where he is and requires no tuning. It consists of a strip map enclosed in a case which exposes a 10 x 4 in. section at a time. A stylus controlled by a series of ground radio stations and an airborne receiver traces the plane's course over the map. The pilot can tell at a glance what his previous track had been by following the pointer's tracing, while its position at time of observation indicates the aircraft's position with relation to the map. It is unaffected by drift.

▶ **Where and When**—On a normal, medium length flight, the pilot would use three maps, one of his departure airport, one en route map and one of his destination field. The departure and destination maps would be detailed and large scale, the en route one small scale. The two map changes while flying take about 45 sec. each. Under good conditions, the unit is said to be able to bring a pilot to within 250 yards of the runway.

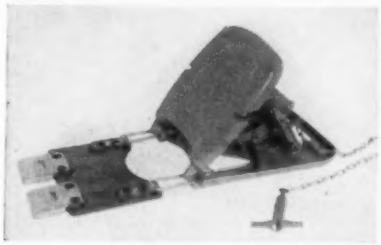
Electrical impulses which mark off regular time intervals on the map, give the pilot a quick check of his ground speed and simplify his ETA calculations.

The British say that besides showing the captain where he is and how long it took him to get there, the Flight Log will enable him to fly a more precise holding pattern when required. They stress simplicity of flying by the instrument. One pilot maneuvered his plane so that the stylus traced his initials on the map.

Statistics of the system and unit: entire airborne set including receivers and power units weighs less than 125 lb. and takes up 3 cu. ft. of space. Manufacturer says that being a simple electro-mechanical device, it is inherently reliable and serious defects can be easily spotted. Decca ground stations had a break of only 156 seconds in a year's continuous operation. Eight months was the average servicing interval on marine and air units now in use.

Present Decca ground stations emit patterns covering Scandinavian countries and the United Kingdom.

NEW AVIATION PRODUCTS



Safety Wheel Chock

A collapsible wheel chock, designed to prevent aircraft slipping during engine run-up and protect ground crewman, has been developed for the Royal Air Force by the Pyrene Co., Ltd., London, England.

The chock consists of an all-metal, spring-loaded ramp which can be extended by operation of a foot lever to prevent forward movement of the aircraft wheel. In the extended position, the ramp hooks to a flexible shoe on which the wheel rests. This assembly has been successfully tested to withstand a thrust of 10,500 lb, Pyrene says.

To free the chock, the ground crewman stands at a safe distance and pulls a chain to collapse the ramp, which then can be drawn clear of the chock shoe. The aircraft then rolls off the flat, flexible shoe. Twin chocks, blocking wheels both forward and aft, also can be used to anchor wheels of parked aircraft.

Pyrene says these chocks are designed for use in all kinds of weather and under various ground conditions.

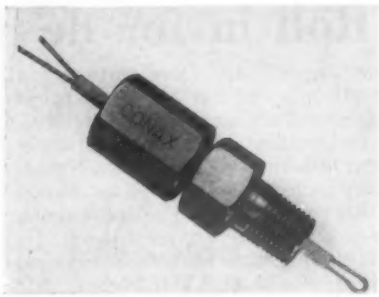
They presently are made in one size only, for wheels up to three feet in diameter, but larger sizes will be introduced later.

Telemetering Motors

A line of miniature motors, employing "many features not formerly available. . ." in units of this general type, has reached the production line of Servo-Tek Products Co., Paterson, N. J. Applications range from fan or blower uses to telemetering sequence switch drives.

The motors use a ring type Alnico V field magnet in conjunction with a 14 commutator segment armature. The company says long brush life and excellent commutation characteristics are achieved through this construction. All units run on precision ball bearings and can be supplied with high-altitude brushes.

Motors weigh around 2½ oz. and measure 1⅛ in. in diameter and 1½ in. in length. The line includes motor voltage ratings from 6 to 28v. dc. and front flange or base mounting arrangements.



Thermocouple Gland

A bare wire thermocouple gland for use with temperatures from −100 F. to 1600 F. and for pressures up to 4000 psi. is being marketed by Conax Sales Co., Inc., Buffalo.

This part is designed to provide the greater accuracy and quicker response of bare wire thermocouples without the leakage and expense usually associated with this method of temperature measurement, according to the company's engineers.

Rapid interchangeability of all parts in the unit permits use of any thermocouple wire to meet individual requirements. This feature also makes life of the gland independent of the bare wire, which can be quickly replaced, Conax points out.

Sealing the wires by compressing dry powdered talc between two ceramic insulators provides an electrical insulation virtually unaffected by temperature or chemical reaction, Conax says (each part is packaged with a supply of insulators and talc). Assembly involves simply sliding the insulators in place, adding talc and tightening the cap.

The "body and caps" are made of Type 303 stainless and the gland follower and key, which do not come in contact with the gases, vapors or liquids, are made of high quality tool steel. Address: 4515 Main St., Buffalo 21, N. Y.

Torque Checker

A lightweight, high-precision torque indicator, particularly suitable for maintaining to rigid specifications torque standards for fastenings in delicate electronic equipment, is being produced by Morrill and Morill, 55 Dey St., New York 7, N. Y.

This compact, hand instrument, named "Torac," calibrates torque screwdrivers and wrenches within its range and tests the actual tightness of fittings—screw nuts, bolts, etc. Among its users are Wright Aeronautical Corp., Federal Telephone & Telegraph Co. and Bell Telephone Laboratories, the company says. Accuracy of the unit is 1 percent of the full scale reading, according to the firm.

Four torque ranges—0-2, 0-5, 0-10, 0-20 lb. in., and three removable bits are available. Others can be furnished to order.

The instrument also can be used to measure the friction of devices such as variable condensers and the starting torque of small motors and for many similar applications.

ALSO ON THE MARKET

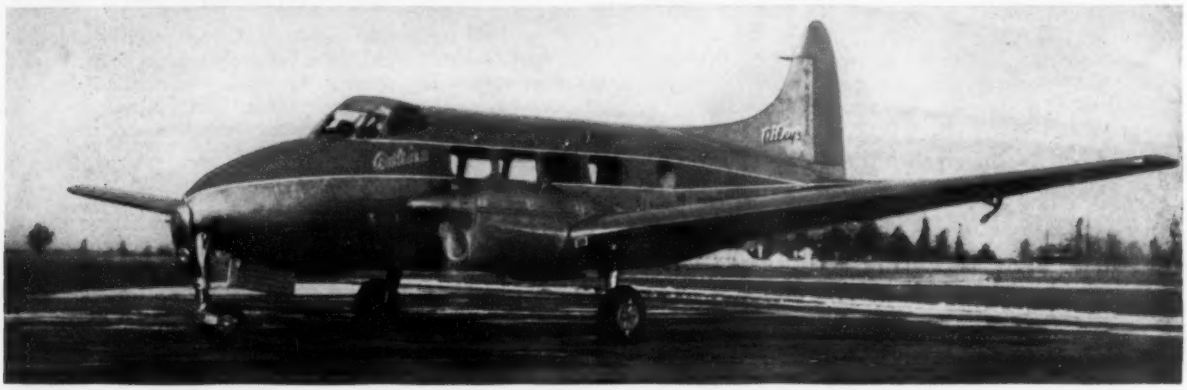
Micrometer in 12 and 24 in. length ranges and available in various throat sizes has scale notched at one-in. intervals and reportedly reads with same accuracy and speed as regular one-in. micrometer. Made by Lester Micrometer Co., Cleveland, Ohio.

"Blo-R-Vac" tank-type cleaner for industrial use can be employed to pick metal particles off floor, remove water and collect odd parts when cleaning stock shelves. Device has 12-gal tank, also can be used as blower to remove foreign matter or as paint sprayer. Made by Ideal Industries, Inc., 5146 Park Ave., Sycamore, Ill.

Stainless steel hose clamp available in six sizes from ½ to 2 in., has band of 26 gauge ¼ hard stainless and ears of 18 gauge stainless. Made by Specialty Products Co., 1965 E. 66 St., Cleveland, Ohio.

Specially compounded washer forces into annular space between bolt and rim of hole to effect water-tight seal. Washer has strong adherence to faying surfaces, helps eliminate squeaks and rattles, according to maker, Presstite Engineering Co., St. Louis, Mo.

SALES & SERVICE



DH DOVE 7-12 place transport bearing U. S. identification is a Riley demonstration model.

American Orders Roll in for de Havilland Dove

A light transport plane that is new on the American scene last week showed promise of gaining U.S. popularity as an executive or feederline type.

The first American distributor for the 7-12 passenger, twin-engine de Havilland Dove has sold the only Dove on hand and taken tentative orders for 28 more the first month of his distributorship.

Jack Riley, Shreveport, La., got his first demonstrator Dove just over a month ago and has set up complete engine and airframe overhaul facilities.

His territory is the South. First sale went to John Wrather, a Texas oilman. Riley's sales manager is Thane Minor.

Riley took off for England recently to expedite delivery of more Doves. He will also negotiate for nine second-hand Doves offered at $30,000 each, with complete airframe and engine overhaul just finished by de Havilland. The planes were traded in by an African airline for four-engined Herons. The engines have zero-zero time.

Meanwhile, Wiggins Airways is waiting for CAB mail pay that would enable the line to take immediate delivery of two Doves for trial operation. If Wiggins finds the Doves meet its requirements, the company plans to convert its whole fleet.

Oregon Dusters Ask Safety Rules

Pilots affiliated with the Oregon Aviation Assn. have taken action aimed at protection of fliers engaged in dusting Pacific Northwest forests in the battle against spruce budworm.

In the 1950 campaign, in which more than a million acres were sprayed, 17 crashes occurred in which seven pilots were killed.

Attributing these accidents largely to wildcat bids from firms that "did not know what they were getting into," the Oregon fliers, meeting at Salem, adopted recommendations that chief pilots should be required to take new pilots on test flights around areas to be sprayed; parachutes and shoulder harness should be mandatory for all pilots, and planes be equipped with stall warning indicators; and all planes used in dusting should be inspected prior to awarding contracts.

Contracts for this year's spraying are expected to total about $1 million. In Oregon, where most of the infected forests are located, 14 contracts will be awarded by the state and federal governments.

Taylorcraft Gets New Capital

Taylorcraft, Inc., Conway, Pa., has completed a new financing program insuring continued lightplane output as long as materials are available for civilian work, as well as enough capital to handle defense orders now on the books and being negotiated. The company is now chartered in Pennsylvania with a capital of $1 million.

Capital has been divided into 500,000 shares having a par value of $2 each, with present holders receiving five shares of the Pennsylvania corporation for each share of the former Ohio corporation now held by them. Graham & Co. of Pittsburgh have underwritten 150,000 shares, most of which have already been sold. The Ohio corporation has been dissolved.

C. G. Taylor continues with the firm and will supervise military aircraft components products. B. J. Mauro remains as president and S. L. Card continues as secretary and treasurer. Newly elected to the board of directors are Clifford Ball and R. V. (Bob) Trader. Trader recently sold his aviation supply company.

BRIEFING FOR DEALERS AND DISTRIBUTORS

► **Inspection Manual**—A practical, handy 80-page guide for personal plane owners is the Personal Aircraft Inspection Manual placed on sale at the Government Printing Office, Washington, D. C., for 55 cents.

► **School Gets School**—New England Aircraft School, one of the oldest in the U. S., was recently donated to Boston University by founder Hilding N. Carlson. The aviation school will continue operation at Logan International Airport until a new building is completed on the university's campus.

► **Cessna Award**—For the second year in a row, R. P. Bowman Co., Oakland Municipal Airport, was chosen its top distributor in the country by Cessna Aircraft Co. The distributor has been located at Oakland for 22 yr.

► **Whiz Distributor Named**—Air Associates has been appointed factory warehouse distributor for R. M. Hollingshead Corp.'s line of Whiz packaged aircraft chemicals.

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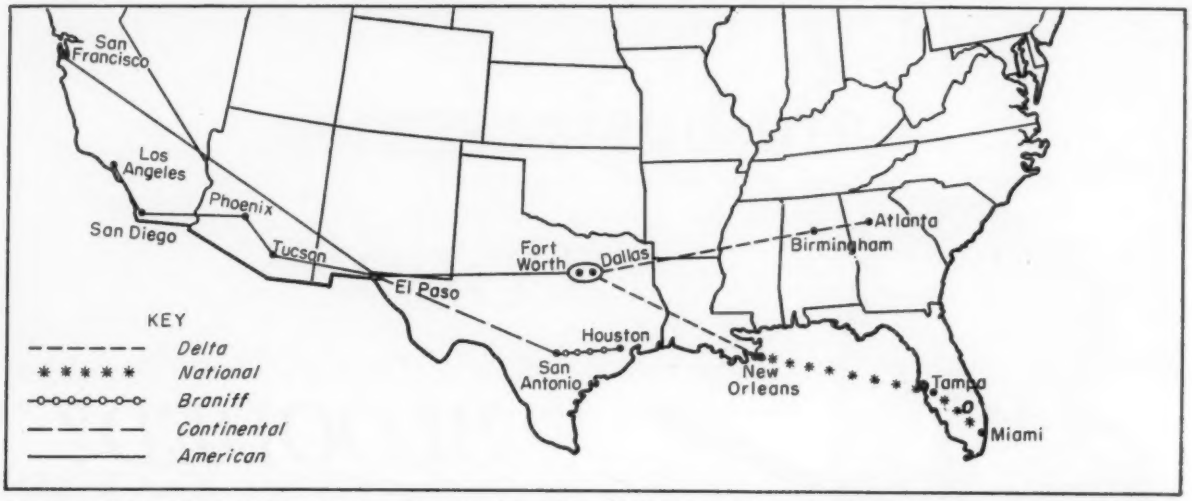

SOUTHERN SERVICE TO WEST by interchange involving Delta, National, Braniff, Continental and American is proposed by CAB.

CAB Rules for Multiple Interchange

Majority proposal favors service by combination of five carriers; Josh Lee enters strong dissent.

In its ruling on the Southern-Service-to-the-West case, the Civil Aeronautics Board makes a policy statement—as important as the decision of the actual case in hand—in favor of interchange as opposed to new routes.

High points of the decision and policy statement:

• **CAB orders interchange** services between five airlines.

• **CAB denies new route** and route extension applications of the original applicant—Eastern Air Lines—and the counterproposals of five other lines.

• **CAB is all out** for double and triple interchanges.

• **CAB is going ahead** on its newly reaffirmed policy to strengthen the existing trunk routes and make no change of the basic pattern.

• **CAB will turn a cold eye** on any new route applications, and thumbs down on new routes that may divert substantial traffic from existing services.

• **Competition** for competition's sake is out.

▶ **Southern Service**—CAB proposes interchanges as follows:

• Atlanta to the West Coast via Delta Air Lines and American, with interchange at Dallas or Ft. Worth.

• Miami to the West Coast via National Airlines, Delta and American, with National-Delta interchange at New Orleans, and Delta-American interchange at either Dallas or Ft. Worth.

• Houston to the West Coast via Braniff Airways, Continental Air Lines and American, with Braniff-Continental interchange at San Antonio, and Continental-American interchange at El Paso.

The Board held the record in the proceeding open to Mar. 31 to permit American-Delta to file for approval of any modification of the Board order, and to allow the other carriers to "enter into and file with the Board for approval an interchange agreement providing for the through service described."

Until the National-Delta-American interchange gets final approval, Delta and American will continue their present interchange service.

Major gaps in service arranged by the CAB to preserve a balance in competition are prohibition of Los Angeles-San Francisco service on the American interchange routes; prohibition of Jacksonville service on the Delta-American interchange routes; leaving Southern Texas cities off any through transcontinental route.

American may fly its segments of the southern transcontinental interchange either to Los Angeles or to San Francisco, but cannot serve both on the same interchange hop. Delta's eastern interchange starts at Atlanta. The previous temporary American-Delta interchange came up from Miami via Jacksonville.

▶ **Josh Lee Dissents**—CAB member Josh Lee tore into the majority CAB decision on both substance and procedure. Said Lee: Southern Texas is left off transcontinental service. The majority has created an inferior and inadequate route pattern which perpetuates a monopoly over one of the strongest route segments in the country. The southern interchange partners set up by the CAB—National, Delta, Braniff, Continental and American—would have conflicting interests.

Dallas, according to Lee's figures, would do without $200,000 annual revenue—the difference between the Delta revenue from the existing American-Delta interchange starting in Miami, and the CAB-proposed system. Delta's incentive will now be to sell Miami-West Coast passengers a ticket to Dallas for transfer to a West Coast trip instead of selling the interchange via National to New Orleans, and via Delta to Dallas from which Delta would get less than half its former interchange revenue.

Braniff similarly stands to lose $56,000 annual revenue it used to make by carrying Houston, Austin, San Antonio-West Coast passengers to Dallas for plane transfer. The CAB-proposed interchange would have Braniff sell Houston and Austin passengers a very short Braniff ticket to San Antonio instead of to Dallas as formerly.

As to procedure, Lee says the Board prejudiced other pending interchange applications for serving Houston, Austin and San Antonio. These should have been consolidated with the American-Continental-Braniff application so the Board could see all the possibilities at once, Lee says. One such proposal that would have broken the American hold on Western segments is a Continental-TWA interchange—San Antonio, Albuquerque, Phoenix, West Coast. San Francisco is not served with one-plane through service by the existing Delta-American interchange.

▶ **Future CAB Policy**—Broad policy statements took the fore in the CAB opinion. Since this is a different CAB from the one that ruled in the earlier postwar era, these statements invite scrutiny for their possible bearing on future CAB decisions.

Among the CAB policy edicts:

• **Less competition.** The route structure does not need competition on every segment. "Competition already prevails over a large part of the nation's airline network and the benefits of the competitive spirit generally, if not always, spread to routes that have no direct competition."

• **Fewer new routes.** Where the only shortcoming of service is absence of through service, "an appropriate interchange operation between connecting carriers should be employed. . . ."

• **Lower fares.** When airline earnings are good, the Board will consider lower rates "rather than adding new competitive services, since lower rates and fare are a means of bringing air transportation within reach of the many people of limited means and an uneconomic duplication of services will discourage the attainment of such objective."

• **Few route extensions.** The Board finds that any further "substantial trunkline route expansion" will be almost impossible to reconcile with statutory policy calling for "development of an economically sound air transport system."

▶ **Interchange Policy**—Here are the principles by which the CAB says it will judge future interchange cases:

• **Minimum interference** with the existing route pattern.

• **No route extensions** to make the interchange, generally.

• **Reasonably direct route.**

• **Leave substantially undisturbed** the historic participation of existing carriers in the traffic served.

• **Avoid interchanges** that would "funnel traffic from connecting carriers that have historically carried it to other carriers."

• **Strengthen existing inter-carrier** channels of traffic movement. "Where the through traffic between areas historically has been developed and routed over certain connecting carriers . . . interchange . . . cannot be said to create a monopoly inasmuch as such interchange will not alter the air carrier route pattern."

DELTA AIR LINES plans conversion of all its DC-3s to 25-passenger capacity.

Delta Joins DC-3 Conversion Trend

Delta Air Lines joins the procession of DC-3 fleet owners who have started raising passenger capacity and modernizing cabin layout (AVIATION WEEK Dec. 25, 1950). Delta is converting its passenger fleet of 18 DC-3s to 25-seat density.

Delta is also operating its DC-3 fleet under the new Part 42 Civil Air Regulation, raising gross landing weight by 800 lb. to 25,200 lb., instead of the 24,400-lb. gross landing weight allowed in transport category waiver.

▶ **Other Airlines**—Delta is only one of several U. S. airlines perplexed by the problem of DC-3 inadequacy in light of present-day war and peacetime developments. Few if any foreign airlines have enough dollars or traffic potential currently to be in the market for new American twin-engine equipment, so DC-3 conversions are becoming popular abroad and in South America. Feeder airlines are in the same boat.

U. S. trunk airlines that have not yet announced twin-engine equipment plans are Capital Airlines with 25 DC-3s and three Super DC-3s; Mid-Continent with 20 DC-3s and 4 Convair-Liners; Chicago & Southern with 12 DC-3s; and Northeast with 8 DC-3s and 5 Convair-Liners.

▶ **Modern Layout**—Delta's converted DC-3s will seat four abreast in six rows, plus one row of two abreast forward and left, opposite the relocated lavatory. The twenty-sixth seat is for the cabin attendant.

Seats are the Super DC-3 type, of foam rubber. They are narrower than standard, but are comfortable. Lavatory is moved forward to the righthand corner of the cabin, where forward cargo bin is on the standard DC-3. Carry-on baggage rack is provided directly across from the main cabin entrance door.

The rear cargo bin and cargo loading door are enlarged. Passenger ramp is integral part of power-operated door.

A coat rack is provided in the area formerly occupied by the buffet, just to right of passenger door. The buffet is moved to just forward of the passenger door, opposite the luggage rack.

Exterior paint job includes white top fuselage and resdesigned decoration. Interior color scheme includes gray carpeting, chairs upholstered in cedar-colored fabric with London tan leather arm rests and trim, cabin side walls up to window finished in gray vinyl, walls up to upper edge of overhead hat racks finished in beige vinyl, ceiling covering of tan gabardine, window curtains in dark green, vertical partitions in cabin finished with wood paneling in natural color.

Removal of one battery, saving 90 lb., is made possible by additional power output from two 200-amp., 14v. generators. The floor is rebuilt completely, using corrugated aluminum with carpet.

Other improvements include new passenger call buttons that stay lighted; VOR radio navigation equipment; redesigned dome lights and new ceiling night lights; cold water dispenser; and buffet holding two food cases of 14 trays each.

Delta's first DC-3 went into the hangar for conversion last month. Last of the fleet should roll out about June, 1952. Out of pocket cost of the conversion is figured at about $18,000 for each plane.

▶ **Airlines Reveal Plans**—Although airlines seldom reveal equipment-buying plans or hopes in advance, they will be doing so soon so they can get DO-priority assurance for the next three to four years. This is because CAB has asked the airlines to file tentative equipment purchase plans for the next four years (to 1954). Then CAB will screen these plans and approve for priority in the Controlled Materials Plan.

• **United Air Lines**, with 58 DC-3s already owned, and 30 Convair-Liners on order for 1952-3 delivery, is well prepared for mobilization or peace. United started to convert seven DC-3s to 28 passengers last summer, but first got held up by DC-4 conversions for the Pacific airlift, then decided to hold the whole project in abeyance, with only

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two planes converted. These two 28-passenger DC-3s are being tested on the San Francisco-Reno run.

United may well convert more DC-3s to 28 passengers, as President W. A. Patterson says: "With some exceptions, the volume of traffic served by our DC-3 schedule pattern doesn't warrant larger or faster equipment. Much of that territory is more comparable with feederlines which still operate DC-3s."

• **Capital Airlines** last summer studied the idea of converting "a substantial portion" of its DC-3 fleet to Super DC-3s. But Capital decided this winter that since the line is making good money on present equipment, consolidation of capital position comes first. Most of Capital's DC-3s are already converted to 24 passengers, with manuallly operated integral stair ramp, but these DC-3s have not undergone any such elaborate modernization scheme as Delta has started.

Capital starts detailed evaluation of its three Super DC-3s next month. Since the first airliners of this type were delivered only last summer, modifications and changes in operating procedures have prevented an earlier complete evaluation. For instance, the power settings have been reduced, thus reducing speed and certain other performance factors slightly from the earlier settings used on the Super DC-3 by Capital. But the Super-Three still yields a far lower seat-mile cost than the DC-3; even plane-mile costs are almost equal (pre-delivery estimates were that plane mile cost might be up to 10 cents over the DC-3).

• **Braniff Airways and Continental Air Lines** have ordered Convair-Liners. Braniff, with 13 DC-3s now, has ordered 20 Convairs; Continental, with 10 DC-3s now, has ordered eight Convairs.

CAB Announces Its DO Procedures

As priorities claimant for new U. S. transport planes, the Civil Aeronautics Board last week announced the procedure and policy it has set up for issuing plane priorities. The plan and policy are as outlined in AVIATION WEEK Jan. 15 and Feb. 5.

Important points mentioned in the CAB announcement are:

• **Board's policy** will be to "support the requests of airlines for all new transport aircraft which can be economically absorbed in the airline system."

• **"Between now and a possible** all-out war, any transport aircraft which are manufactured will be of vital importance in meeting the potential airlift deficit, both military and civilian."

• **Twin-engine aircraft** rate priority along with four-engined planes.

• **Airlines will submit** to the CAB schedules of estimated plane requirements through fiscal 1954. The airlines will here reveal approximate dates when they are prepared to place firm orders for each plane over the coming four years.

• **CAB will evaluate** the airline equipment requirements and may consult with the carriers prior to making any adjustments.

• **Quarterly schedules** of aircraft requirements for DO priority start Mar. 15, going through the claimant-to-NPA-to-Munitions Board channels by Apr. 1.

• **First-quarter** new-transport schedule, including all planes ordered since Nov. 2, will go to the Wright Field Aircraft Resources Production Agency for scheduling with military production by Apr. 5.

• **Board will approve DO** priority only on firm contracts.

• **Board will not approve** advance-requirement DOs—that is, will not push through priorities ahead of the time needed to effect scheduled production and delivery.

• **Requirements schedules** will be reviewed and revised quarterly.

• **Civil Aeronautics Administration** will compile the necessary technical supporting data on new planes in terms of dollar value, amount of critical material involved, and **timing.**

Airline and manufacturer programs should be addressed to the Chairman, Civil Aeronautics Board.

EAL to Launch Daily N.Y.-San Juan Service

Eastern Air Lines starts a daily New York-San Juan DC-4 coach service on Mar. 26. Coach fare filed is $64.50—more than $10 less than Pan American World Airways tourists rates now in effect on the route.

Eastern will also start one round trip New York-San Juan daily on Constellations at the same price as Pan Am.

Eastern also hopes to lower its Miami-San Juan coach fare. The line has twice applied for a base aircoach fare of 4 cents a mile on this run. The company will offer San Juan travelers a triangular plan at the same costs on this routing; they may stop over at Miami on the New York-Miami trip.

Airline Troop Flights Show Sharp Increase

Military business for the airlines is picking up despite the age-old rail preference clause on military travel orders. The Air Transport Assn. military traffic office booked $17,000,000 of military business in 1950 compared with $5,000,000 in 1949. Last month topped $1,000,000.

ATA is at last making headway selling the military on using air transport for more prompt and convenient movement of troops. (See AVIATION WEEK Feb. 5, page 45.)

Latest move is to transport new recruits from induction centers to training bases. Old military system has been to collect recruits day by day until there were enough to herd onto trains in a large group at once. That is bad on morale and involves putting the boys up at hotels after induction or sending them home again until transportation is arranged.

Now some recruiting centers are sending groups of recruits by air to their bases as they sign up.

With a continued selling job by ATA, and removal of the rail preference clause this June 30, military business should become big business for the airlines.

SHORTLINES

► **Aer Lingus**—Irish airline will open a new Dublin-Bristol air service May 3, starting with three trips a week. In summer, Aer Lingus will fly 100 trips a week London-Dublin.

► **American Airlines**—Company carried about 310,000 passengers in January—55 percent more than a year ago. Passenger miles exceeded the July 1950 record of 169,400,000. . . . Schedule completion in January was 97.5 percent, compared with 93.5 percent a year ago.

► **British European Airways**—Carrier will start off-season tourist fares on an experimental basis this summer. For example, return trip on the London-Edinburgh run will be about 7 pounds 10 shillings, compared with present fare of 11 pounds.

► **Civil Aeronautics Board**—CAB has given airline credit card service a permanent okay on substantially the same basis most lines use now under temporary CAB authority.

► **Continental Air Lines**—Company is running a series of war-operations training programs to show personnel how to meet the special operating conditions such as priorities that attend mobilization and war.

► **International Air Transport Assn.**—IATA member airlines are scheduling 20 percent more service in Europe this summer than last. A big spurt in night air coach service is noted in the coming schedules. Germany will get the largest increase in service this year. . . . Final 1949 accident statistics of 59 IATA

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airline members show an improvement in safety over 1948—from one fatality per 30,490,000 passenger miles in 1948 to one per 34,840,000 in 1949. In 1949 there were 19 fatal accidents among the 59 airlines, totaling 306 passenger fatalities. Total passenger miles flown were 10,680,000,000.

► **New York Port Authority**—The Authority has filed a brief with CAB urging approval of transcontinental coach service. The brief protests the recent CAB examiner report which, the authority says, ruled out the irregular carriers but did not decide upon the necessity of the service, or the right of the scheduled airlines to perform it except on the present temporary basis. The Authority says as long as coach service is "temporary," certificated airlines cannot make proper plans for expanding their coach fleets. The Authority has continually argued that coach fares will build air transport and make money.

► **Northwest Airlines**—Company sources report its Stratocruisers are performing well now, with little or no unusual maintenance or utilization problems.

► **Pan American World Airways**—International carrier flew 331,652,000 passenger miles in the fourth quarter of 1950, compared with 391,837,000 in the third quarter and 272,414,000 the fourth quarter of 1949. . . . Company is hiring only women as cabin attendants now because of the problem of the draft of manpower. Past policy has been to have one male and one female cabin attendant on each large plane. . . . PanAm has substituted Puerto Rico for Curacao as a stop on the New York-Sao Paulo run using Constellations, but route time remains 25½ hours. This gives San Juan two roundtrips daily. PanAm had planned to fly Constellations nonstop New York-Caracas, as permitted by CAB, but the Venezuelan government insists PanAm must stop also at either San Juan or Curacao.

► **Piedmont Airlines**—Feeder flew 123,762 passengers in 1950, 44 percent over 1949. Passenger miles are up 41 percent to 26,086,473. Air mail is up 66 percent to 51,835. Freight is up 115 percent to 134,346 ton miles. Express is up 105 percent to 84,454.

► **Trans World Airlines**—Company has filed suit against the City of San Francisco protesting added airport fees. The airline holds a 20-year lease signed in 1942. . . . Company is offering a nine-week all-expense student tour costing $1430 to foreign universities at Geneva, Zurich, or Fribourg, for four weeks of study and five weeks of travel in France, Italy, Switzerland and England starting June 18. The price includes roundtrip Atlantic, European transportation, hotels, meals and sightseeing.

► **United Air Lines**—Company's school and college service last year supplied almost 1.5 million charts, pictures and booklets to teachers and students, and showed slide films to an estimated 2 million and movies to 475,000.

► **Washington National Airport**—Showing growth of the Washington airline market since construction in 1941, total passengers enplaned and deplaned yearly has mounted from 459,396 in 1942, to 1,230,480 in 1946, 1,386,887 in 1949, and 1,629,713 in 1950.

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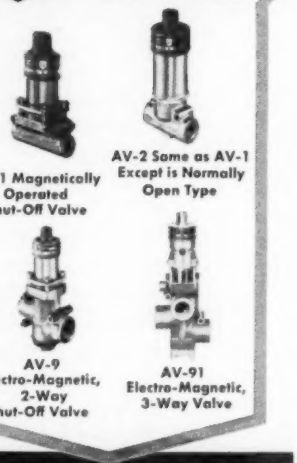

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Feb. 23—Air Transport Command five-year reunion, Waldorf Astoria Hotel, New York. For information write E. K. Hastings, resident manager of the hotel.

Mar. 8-9—Eastern regional meeting, Institute of Navigation, Shoreham Hotel, Washington, D. C.

Mar. 12-13—Short course on uses of aerial equipment in agriculture, Purdue University, West Lafayette, Ind.

Mar. 16—Sixth annual flight propulsion meeting, Institute of Aeronautical Sciences, Hotel Carter, Cleveland.

Mar. 19-23—Seventh Western Metal Exposition, Oakland Auditorium and Exposition Hall, Oakland, Calif.

Apr. 16-18—Society of Automotive Engineers aeronautic and aircraft engine display, Hotel Statler, New York.

Apr. 19-21—Airport Operators Council annual meeting, Hotel Peabody, Memphis, Tenn.

Apr. 24-26—ATA annual engineering and maintenance conference, Hotel Drake, Chicago.

May 12-13—Airlines Medical Directors Assn. eighth annual meeting, Hotel Shirley Savoy, Denver, Colo.

May 13-14—Airline Medical Examiners Assn. fourth annual meeting, Hotel Shirley Savoy, Denver, Colo.

May 14-16—Aero Medical Assn. 22nd annual meeting, Hotel Shirley Savoy, Denver, Colo.

May 17-19—Annual convention of the Women's Aeronautical Assn. of the U. S., Little Rock, Ark.

June 11-15—Second annual conference on industrial research, conducted by Columbia University Dept. of Industrial Engineering, New York.

June 15-July 1—International aviation display, Grand Palais and Le Bourget Airport, Paris.

June 18-July 6—Three-week Air Age Institute course, Parks College of Aeronautical Technology of St. Louis University, East St. Louis, Ill.

June 25-29—1951 summer general meeting of the American Institute of Electrical-Engineering, Royal York Hotel, Toronto.

Sept. 7-11—Third annual Anglo-American Aeronautical Conference, convened jointly by Royal Aeronautical Society and IAS, Brighton, England.

Oct. 3-6—Society of Automotive Engineers aeronautic and aircraft engine display, Hotel Statler, New York.

Oct. 31-Nov. 1—Society of Automotive Engineers fuels and lubricants meeting, Drake Hotel, Chicago.

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814	35814	Blower Assy.
3967	35817	Spring
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4208	35932	Gasket
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15	37993	Housing Stud
28	38314	Rod Assy. Comp
20	45213	Cover
182	46400E	Liner
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1	48347	Cylinder
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175	48363	Shaft
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100	48389	Fitting
209	48390	Retainer
56	48392	Sump
533	48447	Bushing
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COCKPIT VIEWPOINT

An Enlightening Film on Approach Lighting

A symposium on All-Weather Flying was part of the 19th annual meeting of the Institute of the Aeronautical Sciences in New York City. Presiding over this session was Col. J. Francis Taylor, Jr. Chief, All-Weather Flying Division, USAF.

Opening the symposium was a spectacular film on approach lights and runway markings, a project of ATA and ALPA. It was composed of pictures taken by the Landing Aids Experiment Station, Arcata, Calif., and the Sperry Gyroscope Co. Over 50 scenes were included of actual approaches in bad weather. Some were made with visibilities as low as 150 feet and ceiling zero. So impressive were some scenes that the audience occasionally tried to help fly the plane by use of "body English" and exclamations. These pictures are blunt, unmistakable proof of the good and bad points of various configurations.

►**All Types Shown**—All types of approach lights were used and several important factors were demonstrated, namely, the need for alignment reference, contrast, glare elimination, threshold identification and a "go no-go" indication.

For years, airports with left-hand approach light installation have had runway lights knocked down on the right side of the runway. Until recently there was no explanation for this, nor was its significance understood. The answer, an optical illusion produced by left-side lights, is clearly evident in the film. On approaches with no visibility beyond the approach lights, the plane, although perfectly aligned, appears to be on a collision course with the lights. Normal tendency would be to make a right turn. The apparent angle of the left-side lights proves that they do not provide alignment reference during poor visibility.

During low contrast conditions, such as daylight fog, it was impossible to distinguish pavement from sod early enough to land on a runway lacking painted markings. The only clues to the runway were magnetic numerals and tire marks. When the same runway was provided with bold painted markings at the threshold, centerline, and border it stood out plainly. These scenes clearly indicate the need for such markings to provide contrast and to maintain alignment throughout the landing roll.

►**Slope-Line Glare**—The glare factor was shown in approaches to Idlewild using unfiltered slope-line lights. By a bit of clever photography, the Sperry cameramen were able to show simultaneously the pilot's eyes and cockpit instruments as well as the view ahead of the plane. At night the lights were dazzling and the pilot kept squinting and ducking his head back into the cockpit to prevent blinding. Use of red filters over the units eliminated the glare, but the resulting decrease in intensity scored the need for condenser discharge lights.

On many of the approaches it was impossible to anticipate the beginning of the runway, the exact problem of the pilot who must prepare for landing. Only on configurations using a single crossbar was there definite proof of imminence of threshold; whereas several crossbars produced confusion, and no crossbars—no information. The single bar, located 1000 feet from the end of the runway, gave the pilot a gauge by which he could determine the propriety of continuing the landing operation or pulling out. The term "go no-go" aptly describes this necessary feature.

Many other interesting facts are shown in the film. One cannot, for instance, distinguish the right from the left row of slope-line lights when only a few lights are visible. Nor do these lights provide roll or height information. On an approach using centerline installation, a B-17 was rolled and banked and the lights alone established the attitude of the plane. Night approaches at LaGuardia showed the confusion produced by low-powered, ragged-looking, directional runway lights, while the wide angle lights of uniform intensity used at Idlewild outlined the runway clearly and gave good speed and guidance information.

Everyone active in this field should see the film. It gives one the feeling of actually being in the pilot's seat and one can understand his problems and see the solution in undisputable pictures. **—R. C. (Ace) Robson**

(The above commentary was written by R. C. (Ace) Robson, an American Airlines captain and is carried here to represent to our readers the airline pilot's point of view on various issues. The feature will be carried at frequent intervals and any comments by readers are welcome.—Ed. note)

WHAT'S NEW

Telling the Market

Users of aluminum alloys and mill products are going to be delighted with a new data book which has just been issued by Reynolds Metals Co., Louisville, Ky.

The 194-page **Aluminum Data Book** is a revision and enlargement of a similar book issued in 1948 by the Reynolds company.

The handbook includes tables of data on physical, chemical and mechanical properties, tolerances, weights, sizes and production limits.

Pages of explanatory text cover the designation system for alloys, casting methods, casting alloys, foundry and fabrication practices.

In short, the handbook seems indispensable to anyone who works with aluminum and its alloys.

Distribution of the book is without charge to engineers, designers and technical men who request it on company letterhead. Address Reynolds Metals Co., 2500 South Third St., Louisville, Ky.

Machine tool and accessories **Bulletin CL-30** avoids staid approach in descriptions, gives dramatic instances of time savings using Bellows products. Included are detailed specification data. Write the Bellows Co., 222 W. Market St., Akron. . . . New bulletin, **Heat Treat Review,** to be issued periodically by Surface Combustion Corp., Toledo, Ohio, will provide up-to-date information on heat treating in all phases of the metal working field. Offered gratis to industrial metallurgists and heat treaters. Write the Editor, Heat Treat Review.

Colorful 36-page **Catalog ADC-702** contains detailed information, including cutaway views, of Air Reduction's complete line of welding and cutting torches, outfits, tips and accessories. Write Air Reduction Sales Co., 60 E. 42 St., New York 17. . . . **Catalog C1,** by Curtis Universal Joint Co., Inc., is aimed at persons who purchase, design, produce or maintain universal joints. It gives test data, engineering details, and prices. Write company at Springfield 7, Mass.

Revised and enlarged edition of **Accurate Handbook of Technical Data on Springs,** offering engineers many shortcuts on making spring calculations, is available free from Accurate Spring Manufacturing Co., 3811 W. Lake St., Chicago 24.

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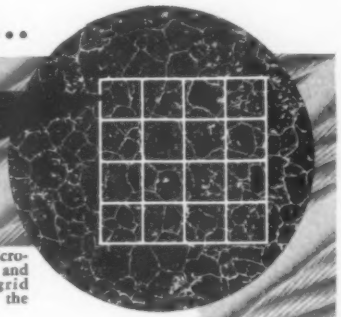

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EDITORIAL

Saucers, Secrecy & Security

We congratulate Look Magazine for smoking out the 3½-year flying saucer mystery. We are sorry AVIATION WEEK didn't solve it. Our alibi is that apparently very few knew the story outside of the Office of Naval Research—not even the Air Force, which sent or permitted its pilots to go on wild saucer chases. As it happened, though the project was not an aviation matter, AVIATION WEEK came very close to the story in 1949.

Look Magazine has performed a public service. But its revelation is a tragic commentary on the low state of the Administration's sense of public duty, and an increasing trend toward unnecessary secrecy. For some three years government spokesmen, from President Truman and the former Secretary of the Air Force on down, told the people impatiently, as though they were children, that what they were seeing were mirages, misinterpretations of various conventional objects or nothing at all.

Yet now it comes out that even while the government was telling the people these things the ONR was busily surveying 2000 reports of "flying disks" and culling out a solid base of reports from plane pilots, scientific observers and reliable laymen. "After a thorough investigation we find there is not a single reliable report of an observation which is not attributable to the cosmic balloons," said Dr. Urner Liddel, the project director.

We hope the Office of Naval Research can pull itself out of this scandal with a sensible reason for keeping this explanation secret for so long. It will have to be a very good reason to satisfy many of us. Otherwise we must charge off the supercolossal flying saucer hoax of the twentieth century as one more example of the chronic Washington tendency to classify everything as secret. Readers of this magazine have often read the opinion here that secrecy is overdone in the national capital; we have seen no better example than this.

The hoax the ONR has perpetrated brought on something akin to public hysteria in some areas, cost the Air Force, National Guard and other public services needless wasted monies in investigations and flights and, most tragic of all, cost the life of an Air Force pilot, Capt. Thomas F. Mantell, whose plane crashed while he was pursuing a "saucer" in 1948. Apparently then, months after the ONR balloon ascensions began, neither ONR nor high Navy officials had tipped off the Air Force, else we can presume the USAF would not order or permit its pilots to try to chase already identified objects that were known to rise to 19-mile-altitudes.

Even if the objectives were considered secret by the ONR, there could have been no apparent security breach in issuing a brief announcement as soon as newspaper reports about saucers began popping up. The announcement could have been restricted to a few words tying the eyewitness reports to new and larger balloons that were making upper air cosmic ray observations and the like. The public would have been satisfied immediately. Because it has known ever since Dr. Robert A. Millikan began taking them 30 years ago that observations of cosmic rays have been going on with balloons. And it also knows that weather balloons are in the air coast to coast, around the clock.

Look Magazine's story quotes Dr. Liddel as saying, "When this project first began, it was kept secret. Now, there is no longer any need for secrecy on a scientific basis. And certainly there is no longer any need to keep the public in the dark about what flying saucers are."

The citizens who have been reading about these things for several years might ask why there was ever any need for secrecy as far as letting them in on the simple fact that larger balloons were being used than formerly to obtain secret information upstairs. What possible military secrecy is revealed by telling the people they are seeing balloons. What secrets does a balloon's configuration betray? Why permit a silly thing like this to develop to the point where human life is lost and the public begins reading about little creatures riding on flying saucers through inter-planetary space and crashing on earth?

The citizens might also ask—if the project was so secret until last week—why the ONR permitted one of its employes to write an official paper for delivery at a public scientific meeting two years ago.

AVIATION WEEK itself in its issue of Feb. 7, 1949, carried a brief digest of a paper delivered in January, 1949, at the Institute of Aeronautical Sciences meeting in New York. The full text of the paper, by E. G. Droessler, a meteorologist of the Geophysics Branch of ONR, was never made available to us. The digest came to us from the Institute. Our headline said "The Navy Has a Skyhook." The digest, as we printed it in early 1949, said:

"Comparatively successful plastic balloon has been developed and is being utilized in broad program of upper atmosphere research. In 52 flights, heavy loads have been carried to altitudes exceeding 30 km. (Note—This is 98,400 feet.) Scientific instruments are carried aloft to collect new information on cosmic rays, biological phenomena, meteorological parameters, etc."

So the public has a right to know the answers to some questions.

If a public address could be delivered in early 1949 describing this hush-hush project even to the extent just quoted how could national security have been breached with the added simple statement that these new balloons could well be responsible for the frequent public reports of "flying saucers"?

Why was the flying saucer mystery permitted to grow out of all reasonable bounds after the first public response to seeing these new balloons? Why was it permitted to build up for three years to the extent of a world wide mystery and even loss of life? Even if ONR had its own reasons for wishing to maintain secrecy, why did not some high Navy official overrule his underlings and break the silence? And if the Navy still wished to keep its own counsel, why was it not overruled by someone even higher in our National Administration who had a sense of public duty and some perspective on this subject of secrecy and national security.

It may be a fair question to ask the ONR whether it deliberately maintained its secrecy not because of national security but in order to encourage the press to continue reporting flying saucers for it, so ONR could obtain its 2000 observations. Now that it has them, perhaps this is why Dr. Liddel says, "There is no longer any need for secrecy."

If this is the explanation for the iron curtain around Project "flying saucers," we are more than ever certain that this country needs a free press as it never needed it before.

—Robert H. Wood